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Medical electrology and radiology

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MEDICAL

Electrology and Radiology.

No. 1. JANUARY, 1905. VOL. VI.

EDITORIAL.

During the past year much useful work has been done in the field of Electrotherapeutics, and perhaps the most important advance will be found in the accurate measurement of the output of the X-ray tube which has been made possible by the employment of specially constructed milliampèremeters in series with the tube and the use of a valve tube, such as that of Villard, which assists in making the current uni-directional. The previous methods of radiometry, namely, the radiochromometers, while they certainly give some measure of the current are open to objection on several grounds: that they are insufficiently accurate, tedious in use, expensive in working, and especially that the results obtained were to a large extent empirical. With the general adoption of the improved method it will be possible that the results obtained by different workers can be accurately compared and the advantage gained by the comparison of a very large number of cases will enable the dosage for any given case to be determined, and will probably tend to reduce the number of cases of "idiosyncracy" to an absolute minimum. In this connection the forms of apparatus worked direct from the alternating main without interrupter should be mentioned, and those of Schall and Gaiffe answer very well with the introduction of valve tubes.

The use of tube shields of lead glass as introduced at the London Hospital, or of rubber, with some arrangement for regulating the size of the area treated by the rays, has become general and has conduced greatly to the comfort of the patient in doing away with the clumsy foil masks and the safety of

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the operator, a point which, as our knowledge of the extreme chronicity and evil results of X-ray dermatitis, cannot be overestimated.

In Radiography the principal improvement consists in the adoption of some form of adjustable diaphragm by means of which the detail obtainable has been markedly increased and the use of heavy currents with short exposures, using some form of electrolytic break and regulating tubes with water-cooled anodes. By this method it is possible to obtain skiagrams of such regions as the hip and pelvis, giving accurate detail with an exposure of from 20 to 40 and the kidney region for calculi in from 5 to 20 seconds.

It is much to be regretted that there was no sub-section on Electrotherapeutics at the Oxford meeting of the British Medical Association in 1904, but it is hoped that this will be remedied in the ensuing year. In the section of Medicine, however, Dr. Lewis Jones read an important paper on the "Graphic Tracings of Faradic and other Interrupted Currents," which we hope to reproduce in an early number, and in the Dermatological section there was a general consensus of opinion in the main details with regard to the indications for the different forms of treatment of lupus. In our next issue we shall deal with the progress of other branches of Electrotherapeutics.

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A CASE OF ACHONDROPLASIA.*

WITH SKIAGRAMS.

By ARCHIBALD D. REID, M.R.C.S., L.R.C.P.,
Radiographer to King's College Hospital,
and HAROLD BALME, M.R.C.S., L.R.C.P.,
Resident Medical Officer, London Medical Mission.

The deformity to which Parrot, in the year 1878, first gave the name of Achondroplasia is not very commonly met with, and only seven or eight cases of this affection have hitherto been recorded in this country. Doubtless many similar cases have been met with from time to time, but up to recent years they have invariably been described as "fœtal" or "congenital" rickets. This mistake has arisen from various points of similarity between the two affections, but achondroplasia is now known to be an entirely different condition, and is perhaps best described as a fœtal disease affecting the growth of all cartilage-formed bones and leading to congenital dwarfing of the extremities and other deformities which exist through life.

Nothing whatever is known as to the cause of the condition. Various suggestions have been offered, and some writers have stated that there may be a hereditary tendency to the deformity. Thus, within recent years, Baldwin has published a case of an achondroplastic woman upon whom he performed Cæsarean section, the child so delivered being found to suffer from the same disease. There is frequently a maternal history of abnormal presentations, difficult labour, etc., and most of the cases recorded have either been stillborn or have survived their birth but a brief time; but all these occurrences are probably to be accounted for by the simple fact that the head of the achondroplastic fœtus is abnormally large.

The characteristic features of achondroplasia are seen directly the child is born, and may be summarised as "a large square head, a long body, and very short limbs." The child so affected grows up to be a dwarf, rarely, if ever, exceeding 3½ or 4 feet in height, the whole of this stunting, however, being due to the smallness of the lower extremities. The arms are similarly affected, but the trunk is normally developed, and the head usually very large. Perhaps the best description that could possibly be written of this condition is that which is given by Dickens in "David Copperfield" when introducing "Miss Mowcher," the original of whom must surely

* For permission to publish this case and loan of plates we are indebted to the *Practitioner.*

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have been afflicted with achondroplasia. To quote David Copperfield's own words :—

" We were sitting over our decanter of wine before the " fire, when the door opened, and Lettimer, with his habitual

Plate L.

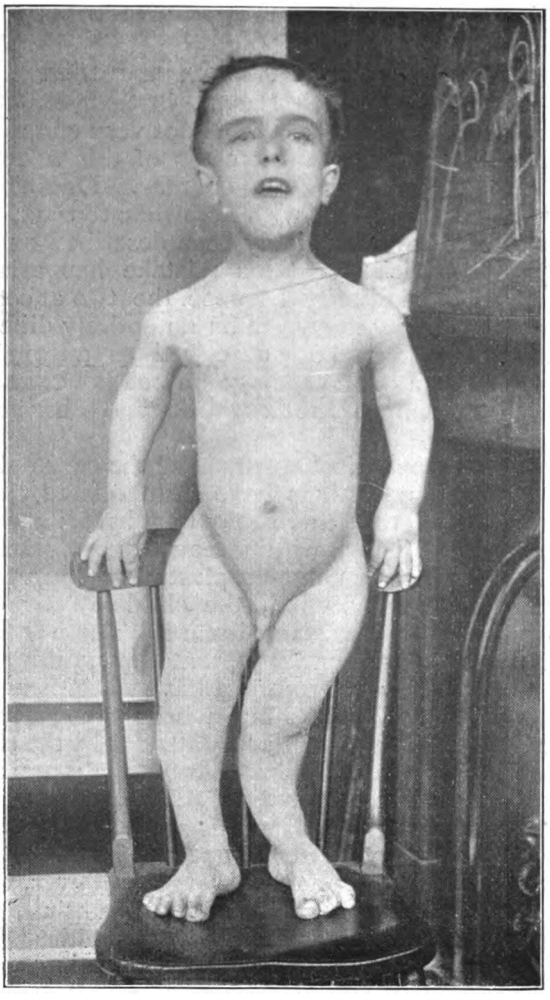

Fig. 1.—Front view of patient. The dwarfing of the stature is seen to be due to the stunting of the bones of the leg, which are in contrast to the normal development of the clavicles and the thorax. This figure also shows the shortening of the bones of the upper extremity, the tips of the fingers barely reaching to the great trochanter. The lateral curvation of the left tibia are also obvious.

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" serenity quite undisturbed, announced 'Miss Mowcher.'
" I looked at the doorway—and saw nothing. I was still
" looking at the doorway, thinking that Miss Mowcher was a
" long while making her appearance, when, to my infinite

Plate LI.

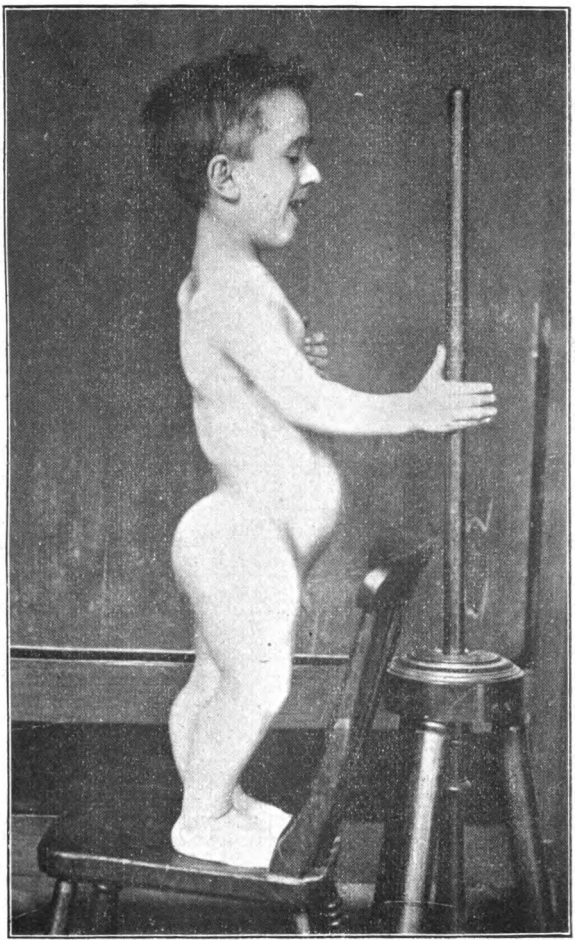

Fig. 2.—Side view of patient. Showing the depression of the bridge of the nose, the expanded cranial vault, and the marked lordosis.

" astonishment, there came waddling round a sofa, which
" stood between me and it, a pursy dwarf of about forty or
" forty-five, with a very large head and face, a pair of roguish
" grey eyes, and such extremely little arms that to enable
" herself to lay a finger archly against her snub nose as she

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" ogled Steerforth, she was obliged to meet the finger half-
" way, and lay her nose against it . . . . . Throat she had
" none; waist she had none; legs she had none, worth
" mentioning: for though she was more than full size down
" to where her waist would have been, if she had had any,
" and though she terminated, as human beings generally do,
" in a pair of feet, she was so short that she stood at a
" common-sized chair as at a table, resting a bag she carried
" on the seat."

Plate LII.

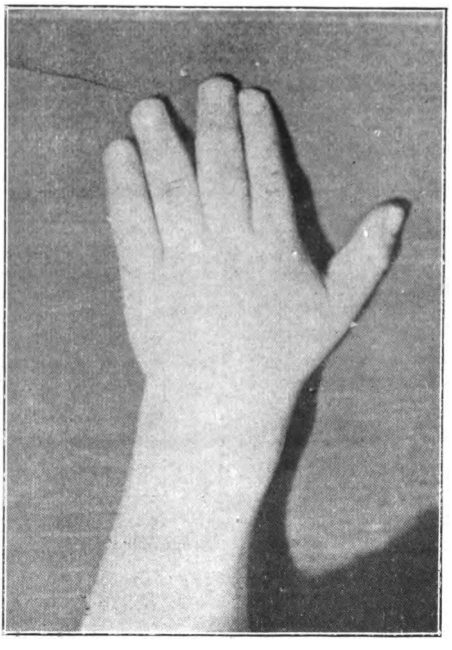

Fig. 3.—Right hand of patient. This shows the characteristic separation of the middle and ring fingers, constituting the *main en trident* of Marie.

All these features, which are to be found in every case of achondroplasia, can be explained by the pathological fact that in this deformity there is defective growth of every bone which is formed in cartilage. Thus the base of the skull (particularly the basi-sphenoid and basi-occipital bones) are stunted and prematurely synostored, leading to depression of the bridge of the nose, and to a great expansion of the bones forming the vault, which are laid down in membrane; all the long bones of the limbs are similarly affected, and are in consequence very much shortened. On the other hand, the bones which originate in membrane, such as the clavicles,

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sternum, vertebræ, etc., are quite normal, and as a result the thorax is well developed and out of all proportion to the size of the limbs, but it is to be noted that lordosis is a constant feature of the affection. For the same reason the height of the patient when sitting down is but little short of a normal individual of the same age, the dwarfing being entirely due to the diminution in size of the lower extremities. Many peculiar features have been noticed as a result of this

Plate LIII.

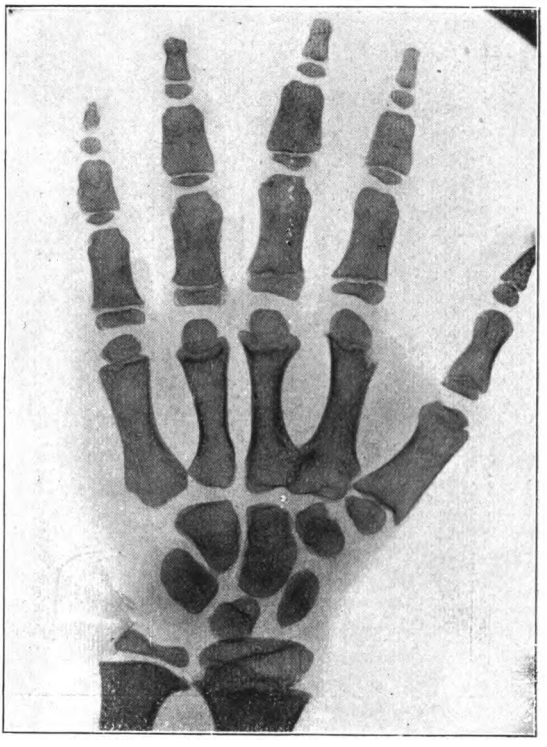

Fig. 4.—Skiagram of left hand (postero-anterior view). This shows expansion of the diaphysis of each of the long bones, and the stunting and increased breadth of the metacarpals and phalanges. The divergence of the middle and ring fingers is seen to be due to excessive expansion of the heads of their proximal phalanges.

extraordinary shortening of the limb bones. One case recorded, for example, could bend down and kiss her toes with ease, whilst her arms were so short that the tips of the fingers could not be made to meet above the head, and when standing upright they barely reached to the great trochanter. The

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affected bones are thick and strong, the transverse diameter being greatly increased in proportion to the length, but this increased circumference is more apparent than real, owing to the great diminution in length. The normal curves are usually exaggerated and marked curvation often occurs, but without any associated buttress formation in the concavity, such as is so commonly seen in rachitic bones. An interesting change is also found at the ends of the diaphysis, which

Plate LIV.

Fig. 5.—Skiagram of left shoulder (postero-anterior view). This shows expansion and notching of the upper end of the diaphysis of the humerus.

become expanded in such a way as to fit in a cup-shaped manner over the end of the epiphysis. This is well seen in the skiagrams published below, and is the cause of the "beading" of the ribs in these cases, a feature which often leads to a mistaken diagnosis of rickets, in which disease the "beading" is due to proliferation of the costal cartilage at its junction with the rib.

Another peculiarity which is constantly seen in this affection is the condition of the hands. The fingers are short,

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each digit being practically of the same length, and they tend to taper at their extremities so as to radiate from one another like the spokes of a wheel (the *main en trident* of Marie), but this separation, as Dr. Thomson first pointed out, is much more apparent between the middle and ring fingers which, often cannot be approximated at their extremities.

Plate LV.

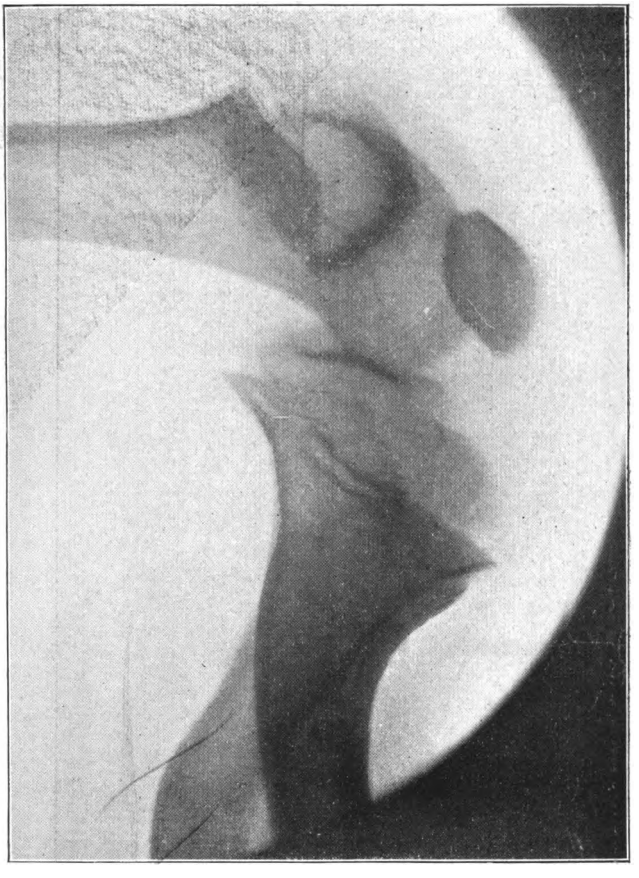

Fig. 6.—Skiagram of left knee (extero-internal view). This shows the mushroom-like expansion of the upper end of the diaphysis of the tibia, and the antero-posterior curve of the tibia and fibula.

The mental condition of the patient is in every respect normal—an important point of distinction from cretinism, with which the deformity has some features in common—and if the patients survive their birth they grow up as a rule to be strong, healthy, and intelligent.

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The case of achondroplasia which is depicted in the accompanying photographs and skiagrams, and which was recently shown before the Society for the Study of Diseases

Plate LVI.

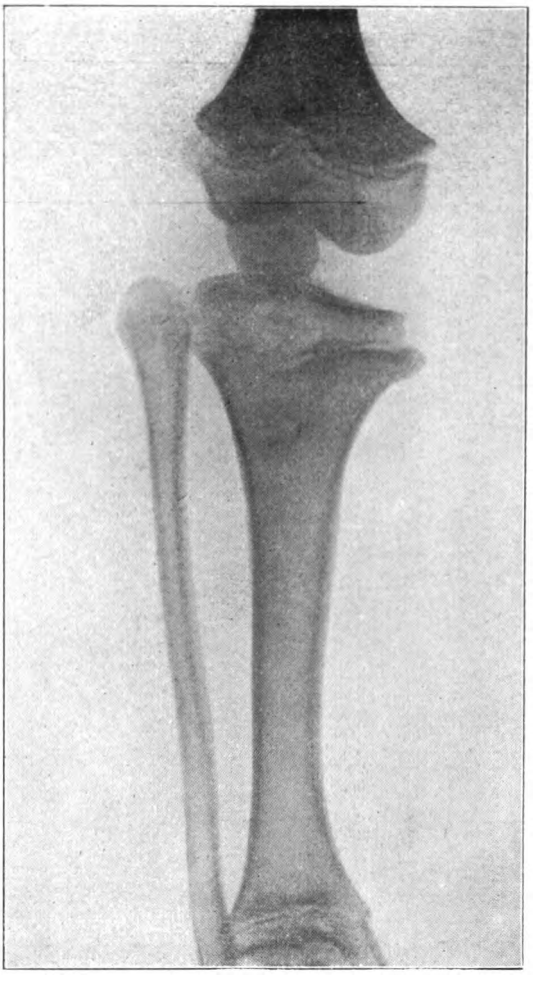

Fig. 7.—Skiagram of right leg (postero-anterior view). Showing marked expansion of the lower end of the diaphysis of the femur, and both upper and lower ends of the diaphysis of the tibia.

in Children, is that of a boy, H.M., aged 12 years. At the time of his birth his mother was aged 44, six years having elapsed since the birth of her previous child (though she had

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had a miscarriage three years after that event). Altogether the mother had had nine previous pregnancies.

The confinement was difficult and artificial respiration had to be resorted to, as the child was in a state of partial asphyxia. As soon as he was born he was noticed to have a large head and very tiny arms and legs. Since that time he has always been a healthy child. He was breast-fed in

Plate LVII.

Fig. 8.—Skiagram of right foot (extero-internal view). This shows marked expansion of the lower end of the diaphysis of the tibia.

infancy and dentition occurred at the ordinary time, but his mother did not allow him to attempt to walk until he was a year and nine months old, as "he was so fat." He then made rapid progress and has always been particularly strong. He has always been a bright, sharp boy, but was not sent to school until two years ago, as he was so much teased by

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other children. Since then he has done well and seems to possess good intelligence.

At the present time (at the age of 12) his height is only 38¾ inches, and he presents the following special features of the affection :—

The head is abnormally large and square, measuring 23¾ inches in circumference, but is free from bosses or other signs of disturbed growth. The bridge of the nose is very depressed and the arch of the palate distinctly high.

Plate LVIII.

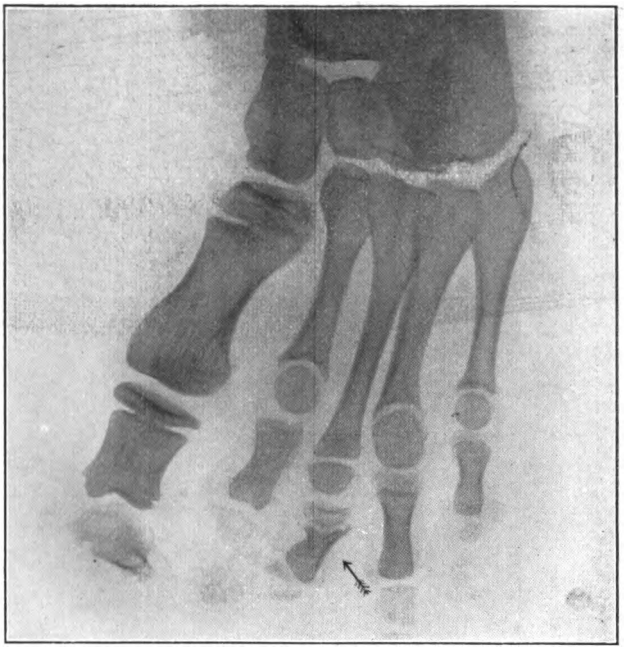

Fig. 9.—Skiagram of left foot (plate on dorsum). This demonstrates the inequality in the length of the metatarsals and the distortion of the terminal phalanges.

The thorax is well developed and measures 24 inches after deep expiration. The clavicles are normal in length, though rather more curved than usual. The scapulæ and sternum also appear normal, but there is marked beading of the ribs. The vertebral column measures 20¾ inches from the occipital protuberance to the tip of the coccyx, and there is well-marked lordosis. The thyroid body is palpable, and there are no sufraclavicular pads.

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The arms are very short so that the fingers only just reach the bottom of the great trochanter when the boy is standing upright. The humeri are short and thick and slightly curved, and the elbow joints cannot be extended beyond an angle of about 160°. The hands are small and fat and the fingers all of the same length; they show very clearly the characteristic separation between the middle and ring fingers (fig. 3).

The femora are short and thick, the lower epiphyses appearing relatively broad and massive. There is a marked lateral curvature of the left tibia and fibula, but the corresponding bones on the right side are quite straight. The feet are somewhat deformed.

The following measurements of the chief bones, &c., are given in parallel column with those of a normal boy of the same age, for the purpose of comparison :—

	Achondroplastic Patient.	Normal Boy of same age.
Height	38¾ in.	55¼ in.
Height when sitting	26 ,,	27½ ,,
Crown of head to umbilicus	20 ,,	22½ ,,
Umbilicus to sole of feet	18¾ ,,	32¾ ,,
Suprasternal notch to symphysis pubis	16⅕ ,,	15¾ ,,
Circumference of head	23¾ ,,	20¾ ,,
Clavicle	5⅛ ,,	5⅛ ,,
Humerus (acromion to ext. condyle)	5½ ,,	10¼ ,,
Radius	5 ,,	7¼ ,,
Ulna	5⅝ ,,	8 ,,
Wrist joint to tip of middle finger	5¼ ,,	5¾ ,,

	Achondroplastic Patient.	Normal Boy of same age.
Circumference of hand	5¾ in.	7 in.
Thumb	1⅜ ,,	2 ,,
First finger	1⅝ ,,	2⅝ ,,
Second finger	1⅝ ,,	2⅞ ,,
Third finger	1⅝ ,,	2¾ ,,
Fourth finger	1⅜ ,,	1¾ ,,
Circumference of upper end of humerus	8½ ,,	10 ,,
Circumference around crest of pelvis	21 ,,	22¼ ,,
Ant. sup. spine to internal malleolus	15½ ,,	28¼ ,,
Femur (great troch. to ext. condyle)	8¼ ,,	13½ ,,
Tibia	6¼ ,,	11¾ ,,
Fibula	7¼ ,,	12½ ,,
Length of foot	6½ ,,	8¼ ,,
Circumference of lower end of femur	10 ,,	11¾ ,,

The above measurements not only show the great diminution in size of the bones affected in this deformity, but they also confirm the fact that membrane-bones are unaffected, and a comparison of the height of the two boys down to the

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umbilicus prove the accuracy of Dickens' description of "Miss Mowcher" as being "more than full-size down to where her waist would have been." A comparison is also given of the circumference of the upper end of the humerus and of the lower end of the femur in each case, in order to demonstrate that the so-called thickening of these bones is more apparent than real.

Notes on Skiagrams.

In examining the condition of the bones in this patient, a series of skiagrams (figs. 4 to 9) was taken, including the whole bony skeleton, and has been found that the special features which they present are corroborative of the clinical diagnosis. In referring to these special features, it will perhaps be better in the first place to mention those bony structures which are apparently normal, and afterwards to discuss the peculiar abnormalities which the case exhibits.

(1.) The long bones throughout the body, with a few exceptions which will be dealt with later, are uniformly straight.

(2.) The scapula, sternum and spinal vertebræ show no peculiarities in structure or size; and the clavicle, except that its curves are perhaps very slightly exaggerated, does not differ from that of a normal child of the same age.

(3.) The epiphyses of the long bones present no irregularities, nor are they increased in breadth or depth, and the epiphysial line is sharply defined.

With regard to the special abnormal features which the case presents, the following points are of interest:—

(1.) The cartilage-bones of the extremities, without exception, are markedly shortened, and at the same time increased in their transverse diameter.

(2.) The ends of the diaphyses of the affected bones are generally enlarged in such a manner as to form a mushroom-shaped surface to accommodate the epiphysis. This is one of the most striking features of the deformity, and is well seen in figs. 4 to 8.

The beading of the ribs mentioned above is also due to this condition.

(3.) In the case of certain of the bones the outline of the end of the diaphysis is irregular, giving a notched appearance to the skiagram. This is specially shown in the upper end of both humeri (fig. 5), and the distal extremity of the second metacarpal of both hands (fig. 4).

(4.) There is a general bowing of the shaft of both humeri in an antero-posterior direction, and a similar lateral curvature of the left tibia and fibula. This curvature affects the whole

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shaft of the bone uniformly, and there is no tendency to buttress-formation in the concavity, such as occurs in rickets.

(5.) In the hands (fig. 4) the carpal bones appear normal, but the metacarpals and phalanges are much stunted and broadened. It is probably due to the expansion of the distal ends of the first phalanges that the characteristic separation between the middle and ring fingers is produced.

(6.) In the foot the special features already mentioned as being found in the hands are reproduced, with the addition that the second metatarsals show a much greater diminution in length than the others.

CORRESPONDENCE.

THE INTRUSION OF LAYMEN INTO MEDICAL PRACTICE.

DEAR SIR,

Dr. Donald Baynes' able address upon a subject in which the profession are beginning to take an increasing interest, has suggested the advisability of recording the following case.

One morning recently I received a telephone call from a general practitioner in the West End, asking me to attend at a patient's house, to assist by means of X-ray examination in confirming a diagnosis of mediastinal tumour.

My fee was asked and agreed to, and the necessary preparations were made (which I need hardly remind the readers of this Journal are very elaborate for the satisfactory carrying out of such a case as this).

Within a short time of starting the appointment was cancelled by telephone, a letter following from the medical attendant to the effect that the patient's brother, a doctor, had been to Messrs. Allen & Hanbury, who would undertake the case for a lower fee.

The medical attendant's letter was one of great courtesy and deeply regretting the turn that affairs had taken.

I do not pretend to underestimate Messrs. Allen & Hanbury's knowledge of mediastinal tumour and its complete diagnosis by the X-rays, as I am ignorant of its magnitude, but the reception of a letter sent with a patient, some time ago, with "If out, try Messrs. Allen & Hanbury," on the outside, leads me to suppose that their reputation is being made rapidly. What that reputation is—is another matter.

Yours, &c.,

(Signed) EDWARD W. H. SHENTON, M.R.C.S., L.R.C.P.
Radiographer to Guy's and St. Peter's Hospitals.

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X-RAYS IN THE DIAGNOSIS OF JOINT CONDITIONS.

By EDWARD W. H. SHENTON, M.R.C.S. Eng., L.R.C.P. Lond.

(Continued from p. 434, Vol. V.)

In the wrist one is called upon chiefly to ascertain the presence and extent of a Colles fracture. This fracture needs carefully looking for, and without continual practice great

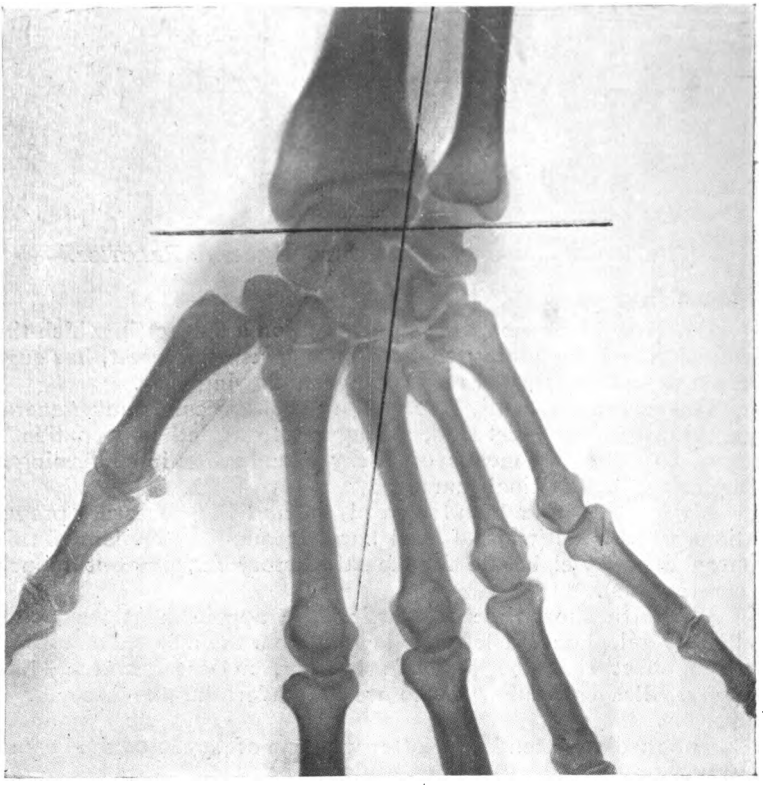

Fig. 1.

difficulty would be found in giving a negative diagnosis. When present in its extreme form it is of course very evident to the eye of one familiar with the anatomical appearance of the part, but as this fracture is so often met with in its milder forms, some aid to diagnosis is desirable.

When the lower end of the radius is fractured there is invariably some shortening of this bone conversely when the

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styloid of the ulna is separated (and in about 50% of cases it is), there is an increase in length. Measurement must be made of both bones from the tips of the styloids.

If, in a normal skiagram of the antero-posterior aspect of the wrist, a line be drawn joining these processes, as in fig. 1,

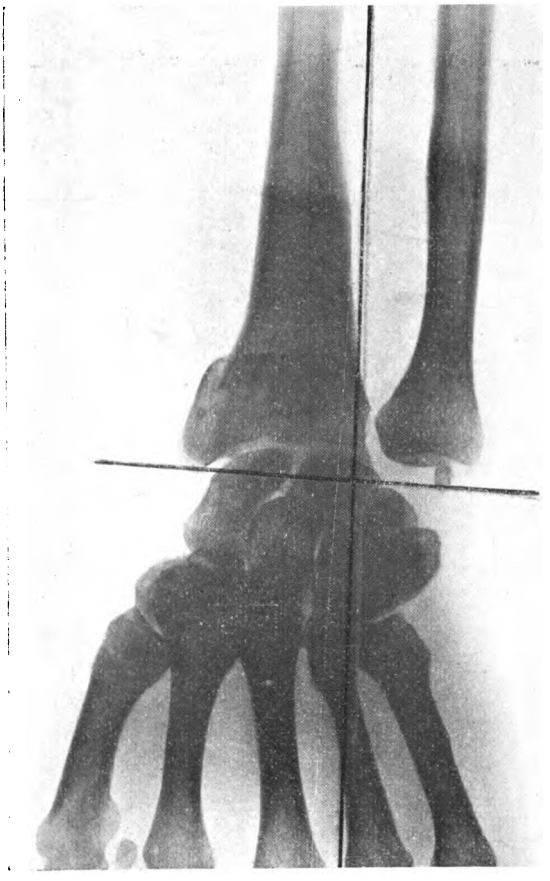

Fig. 2.

and the perpendicular line of the forearm be described, it is evident that these two lines do not cross at a right angle, the tip of the radial styloid being lower (anatomically) than the ulna styloid. Any material alteration in the relative arrangements of these two lines must be regarded with suspicion. If they cross at a right angle the evidence is strongly in favour of Colles fracture.

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As in most forms of surgical diagnosis, comparison with the opposite side is very helpful to eliminate anatomical peculiarities. Confirmation of the condition must now be sought by looking at the part laterally, and there the one and only line of any value is the natural posterior outline of the radius. Look minutely for any irregularity and be sure that a small sharply-defined shoulder of bone disturbing the

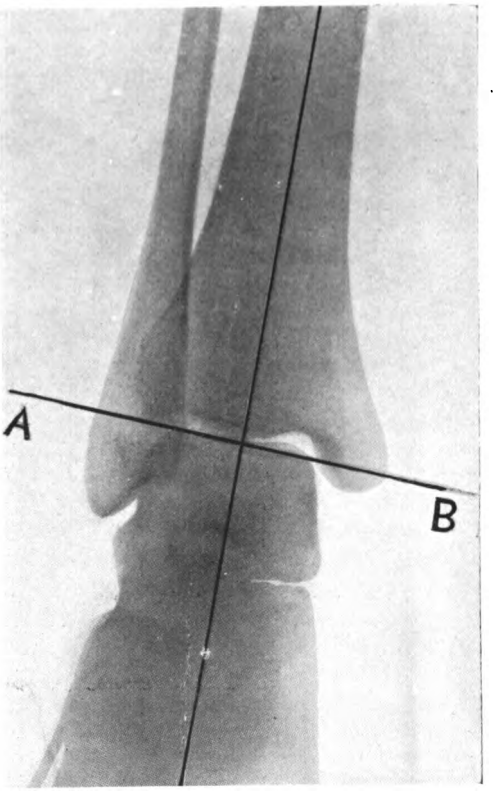

Fig. 3.

contour is an infallible sign of fracture. A wavey outline means nothing, but a small angular interruption is never present without a Colles fracture.

In the ankle region, slight fractures of the fibula and of the internal malleolus are likely to give trouble before their presence can be determined absolutely.

On account of the very little displacement often observable, it is difficult to find lines that will assist much. The

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best one can do in these cases is to arrange the foot so that a perfect lateral view is obtained, and carefully inspect the posterior outline of the fibula. As the fracture in this situation is invariably downwards and forwards in its general direction, it is usual to find a sharp peak of bone pointing upwards and backwards, which is the upper end of the lower fragment.

Viewed from in front much help may be obtained by lines drawn as in fig. 3, *i.e.*, a verticle down the tibia and one touching the superior outline of the Astragalus; these can be easily made out upon the screen. The opposite limb is examined and the angles at the crossing of the lines of both ankles compared. It is obvious that the line *A.B.* will alter its relationship to the verticle when the internal lateral ligament has parted, the internal malleolus has been separated, and occasionally, but not invariably, when the external malleolus has been separated. A discrepancy between the angles of the lines of one ankle and those of the other is very strong evidence of one of these conditions.

The knee presents no difficulties to the X-ray diagnostician on account of the comparative simplicity of the joint.

Close observance of outline is all that is needed in cases of doubtful fractures.

ZEITSCHRIFT FÜR ELECTROTHERAPIE,

December, 1904.

RED AND BLUE LIGHT IN THE TREATMENT OF WOUNDS.—According to the experience of Dr. Breiger, phototherapy can render signal service in the treatment of wounds in general. Red light is found to sensibly diminish the hardness of cicatrisation in both recent and chronic wounds (such as chronic ulcer of the leg), it also lessens purulent secretions and induces a rapid absorption of effusions of blood. The favourable effects of red light were particularly marked in the case of contusions. Blue light is of considerable use in the relief of pain.

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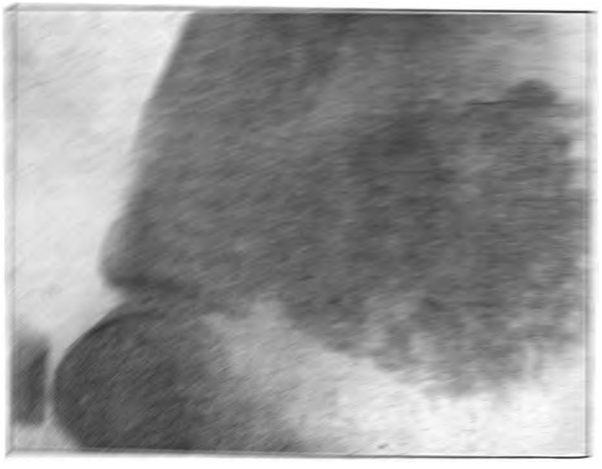

A man aged 42 years had met with a severe accident through the breaking of a ladder which he was climbing, falling violently with the right knee acutely flexed. There was great pain and enormous swelling of the limb, necessitating his immediate removal to a hospital, where he lay under treatment for six weeks. The condition presented by the limb at this time seems to have caused great difficulty of explanation, and according to the patient the question of free incision into the swelling, or even amputation, was discussed, but in consultation it was decided that no operation should be performed, and under general measures the limb gradually resumed its wonted appearance, and within six months the patient was as well as ever. He had always been

a strong, active man, and in youth and early manhood engaged freely in athletic recreations of all kinds, *e.g.* cricket, football, dancing, etc., without inconvenience, whilst now, in maturer years, he is able to walk long distances and discharge his various duties as a clergyman without any difficulty.

Present Condition.—The whole calf region immediately below the right popliteal space is filled out with a hard mass, which gives no pain or discomfort worth mentioning, but exhibits a certain amount of tenderness on firm pressure being used in attempting to make out the exact shape and connections of the swelling. The circumference of the left leg is 16 inches, whereas that of the right leg is 19½ inches the increase being caused entirely by the projection backwards of the bony tumour. The skin of the leg is normal in appearance; there is no enlargement of the veins, no œdema, and no sign of pressure on the nerves. The attachment and relationships of the exostosis are shown clearly in the skiagram.

There is no lameness, and although the right leg of his trousers is a good deal larger than the left, his tailor has managed matters so skilfully that nothing unusual would be detected by the casual observer. The patient has the impression that not only has the swelling not increased of late years, but that it is actually a little less in size.

It would appear from the statements of the patient that the real nature of the outgrowth had not been recognised, and it now gives so little trouble, in spite of its size, that the question of the operative interference is not seriously entertained.

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THE POSITIVE AND NEGATIVE DIAGNOSIS OF RENAL AND URETERAL CALCULI BY THE X-RAY.

By LEWIS GREGORY COLE, M.D.

Skiagrapher to the Roosevelt Hospital; Attending-Skiagrapher to St. Mary's Hospital; member County Medical and Roosevelt Hospital Alumni Association; Clinical Assistant Vanderbilt Clinic.

With the advent of the X-ray and the positive diagnosis of some cases of renal and ureteral calculi, there was a feeling of great relief because at last there was some method of diagnosing renal calculi with absolute certainty. This unfortunately was short-lived, and when, owing to the short experience and lack of technique, renal calculi were not detected in all cases where they were present, the surgeons were as prone to discard it as an aid in diagnosis as they had been anxious to accept it. I grant that many cases were needlessly operated upon and no calculus was found, and that in some cases calculi were found on operation that had not been shown in the skiagraph. The causes of failure were threefold, viz.:

(1) Lack of apparatus and technique.
(2) Inexperience in making and reading skiagraph.
(3) Large size of some subjects.

The great mystery to me is, how the early skiagraphers ever showed renal and ureteral calculi with the apparatus they used. Only 15 months ago I tested eight makes of coil with the same tube and interrupter, and with only three out of the eight was it possible to get anything like satisfactory results in renal skiagraphy. The test was a liberal one, viz.: that we should get a good skiagraph of a hip of an adult man weighing 150 pounds in 45 seconds. The same box of plates was used for all cases and they were all developed at once in the same developer.

The *technique* is a thing which is hard to describe. The tube is first tested by looking through the patient's chest with a fluoroscope; the plate is then placed horizontally on the table and backed up by some metallic substance. The intestinal tract, having been thoroughly emptied, the patient lies with his back flat on the plate, the upper edges of an 11 × 14 inch plate, being at the tenth dorsal vertebra, and if necessary the knee may be flexed to enable the small of the back to come in contact with the plate. The abdomen is covered with a sheet—this, however, should not be interposed between the patient and the plate. The tube is then placed 18 inches from the plate, vertically over the umbilicus. The patient is instructed to exhale the air from his lungs and retract his abdomen and hold his breath during the exposure. If the patient breathes during the exposure, the kidney moves from ¾ to 1½ inches during respiration, and instead of having

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a shadow the size and shape of the calculus, there will be a line the width of the calculus and ¾ to 1½ inches longer than the calculus.

The exposure is then made from 5 to 15 or possibly 20 seconds for cases weighing 150 pounds or less, and not over 45 seconds for any subject even though he weigh 200 pounds or more.

Plates should be placed in envelopes just preceding their use and should be developed or removed from the envelope soon afterward. The plates should not be exposed to strong light and never to the direct rays of the sun while in the envelopes.

The plates are developed with hydrokinon, carrying the developing well through to the back of the plate, and getting as much density in the high lights as possible, while the shadows cast by the bones remain clear and white.

Inexperience.—Much of skiagraphy has been done by the busy general practitioner or surgeon who has neither time nor opportunity to watch details and he leaves the developing to his assistant or nurse, or starts it to developing when he goes on his regular round of patients and takes it out of the developer when he returns, and then if it fail to show a kidney stone he blames the X-ray. The secret of success depends upon the closest attention to every detail.

Reading of the skiagraph is perhaps the most important of all. It must show the ilia, vertebra, and their transverse processes all the way to the tip, the 10th, 11th and 12th ribs, and the psoasiliacus muscle. It may also show the walls of the intestines and kidneys, but this is not necessary even for a negative diagnosis. If this detail show—and it may be made to show even in a subject weighing 200 pounds—and no shadow appear in two such plates either in the region of the kidney or along the ureter, one may safely make a negative diagnosis, but only on such plates is it justifiable.

Much has been said regarding the composition of the calculus. Last spring I made exposure of various calculi, the smallest being 0·078 of a gramme of pure uric acid crystals, another slightly larger but cut in half, of ammonium urate. These were in a glass-covered box behind a patient weighing 125 pounds and with a 15-second exposure. All the calculi showed very distinctly even the 0·078 gramme of pure uric acid.

I have also shown in a man weighing 143 pounds an accumulation of uric acid crystals held together by muco-pus, which was not solid enough to hold together when removed from the pelvis of the kidney.

With the apparatus I have at present I am limited by the size of the patient to women weighing 160 pounds and men weighing 180; not that one is unable to show calculi in

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subjects larger than that, but I cannot *always* make a skiagraph on persons larger than that on which I feel justified in making a negative diagnosis.

I have, however, in two cases made skiagraphs of patients weighing 200 pounds or over, showing sufficient detail to justify a negative diagnosis.

Within the last two years I have made skiagraphs of 179 cases, and out of that number one case was found to have a calculus that I failed to detect. This was because the plate I used was too small and did not show the kidney region. It, however, showed a ureteral calculus at the lower end of the ureter. In three cases in which shadows were interpreted as renal calculi were caused by other substances; two of these were gallstones and the other was fæces in the descending colon.

In closing let me impress upon you that the better your skiagraph and the more detail you have the more difficult it is to interpret.

THE CONTINUOUS CURRENT.—At the fourteenth annual meeting of the American Electrotherapeutic Association, held at St. Louis in September last, Dr. A. D. Rockwell, in his presidential address, called attention to the widely different conditions confronting those who did the pioneer work of Electrotherapeutics from those which exist at present. Mechanisms for practical work were of the rudest construction, and there were no instruments of precision. Now innumerable gradations and manifestations of electric force are available, and the laws which govern it are so understood that it becomes obedient to our will in innumerable ways. Empiricism still attends its use to a considerable extent, and it is still the home of much of ignorance and credulity. The world is not yet aroused to its vast possibilities in Medicine. The American Electrotherapeutic Association is unique in that it devotes itself solely to the discussion of Electricity as a remedial agent. In this concentration of energy upon a single object he sees an element of strength; but there is also one of weakness, in that there is danger of forgetting that one is a physician first, and an electrotherapeutist after. Honesty of purpose and absolute integrity in clinical reports is the only shield of defence for the electrotherapeutist. Simple honesty of purpose, combined with education and observation, is capable of lifting this department of medicine to a higher plane. To the majority of physicians, electricity is an unknown and unexplored region. The members of the Association should restrain their enthusiasm, and not permit the subordination of the judicial faculty. He said, "Be true, if you would be believed; understate rather than overstate." Attention is called to the practical abandonment of the continuous (galvanic) and magnet-induced (faradic) in favour of the newer forms of static and high frequency. The latter do not constitute the whole of electrotherapeutics and current differentiations should obtain. The use of one modality should not obtain, because of ease of administration.—*New York Med. Record*, October 1st, 1904.

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DIGEST OF CURRENT AMERICAN LITERATURE.

SOME OBSERVATIONS ON THE MEDICAL USES OF THE CONTINUOUS (GALVANIC) CURRENT.—Dr. Daniel R. Brewer presented a paper on the above subject to the American Electrotherapeutic Association at its St. Louis meeting. He states that a study of the current medical literature, and the proceedings of the American Electrotherapeutic Association as well as of kindred societies, led him to the conclusion that the profession is drifting away from the medical uses of the continuous current. In the case of administration of static and high frequency currents, as well as their striking effects, the advantages of the direct and constant currents that does its work so quickly are lost sight of. Brewer refers to the original work done by Stewart, of England, and also to the work of Cleaves and Herdman, of the United States, and Leduc, of France. Brewer finds it surprising that there should be so many in the profession who are unwilling to admit anything in the medical uses of this powerful agent except such as is the result of suggestion. They say it is psychic, that this power which has become such a factor in the economies of the day, so that everywhere around us its usefulness has made it a necessity, so that commerce and manufactories are so absolutely dependent upon it that their forces would stop if the world were deprived of its use,—that such a power some would have us believe has no more effect upon the human body of a curative character than such as is purely mental, or than such as might come from the use of Christian Science or Dowieism. Attention is called to the diagnostic value of the continuous current, a value that not the most sceptical physician can gainsay. The diminution of electrical resistance in exophthalmic goitre is sufficient to make a diagnosis even when there is no exophthalmos present. It is of value in differentiating certain cases of tetany from hysteria. By the changes in electrical reactions of nerve and muscles the atrophies of disuse and the myopathic muscular atrophies are differentiated from organic nerve disease. Its value in cerebral disturbances, such as cerebral syphilis, cerebral neurasthenia and cerebral paralysis is emphasized. Also the striking results obtained from its use in poliomyelitis anterior acuta. The most brilliant results in nervous diseases from its use Brewer believes to be in multiple neuritis. Attention is also called to the value of cataphoric medication, especial reference being made to the use of liquor iodi compositus at the anode in inflammatory exudates.—*Archives of Electrology and Radiology*, November, 1904.

Remark.—A good many years before the discoveries of Galvani and Volta, which gave to the world the direct continuous current, static electricity was known and used therapeutically. Subsequent to the development of the voltaic pile, the continuous (galvanic) current and later the magneto-induced (faradic) came into use for therapeutic purposes and for a long time dominated the electrotherapeutic field. Of late years, especially since the dis-

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covery of Röntgen, static electricity and high frequency currents have assumed a position of paramount importance and the newer and younger workers in electrotherapeutics have no knowledge whatever of the chemico-physical effects, the physiological action and therapeutic results of the continuous current. This, the writer feels, is all wrong, and a very large clinical experience in the use of the continuous current, extending over 15 years, not only duplicates the results obtained from the use of static and high frequency currents in given pathological conditions, with which the literature of the day is flooded, but in many instances surpasses them. The writer regards a knowledge of its physics, chemico-physical effects, physiological action and therapeutic applications as fundamental to all electrotherapeutic measures. By reason of its chemico-physical effects, extending as they do into the interpolar region and its very definite polar action, it is the current *par excellence* with which to produce an action upon organized products of pathological change, as for example upon inflammatory exudates. The fact that so far as is known all currents within the continuous magneto-induced, sinusoidal, static or high frequency, produce electrolysis and cataphoresis in a homogeneous mass like the tissues of the body, but that it is only with the continuous current that the products of decomposition are brought to the poles, need only be kept in mind to emphasize the value of the latter in a wide range of disease. It would be well, the writer believes, if the modern electrotherapeutist would make himself familiar with the work of the pioneers in this field, among whom may be mentioned the late editor of *Medical Electrology and Radiology*, in addition to those referred to. Its application requires more of effort both on the part of the physician and the patient than static and high frequency currents, but when skilfully and intelligently made the results will more than compensate for the additional work.—The American Editor.

NOTICES OF BOOKS.

Les Applications Médicales du Radium. By Dr. Foveau de Courmelles, published by Henri Farjas, Paris. Price 1 fr. 25, pp. 125, 8vo., paper backs.

We have here a concise summary of what is at present known of the actions of radium and its salts. From discussing its effect on the young of various forms of animal life in retarding growth and producing monstrosities, the author passes to the action of radium on the retina and on the blood. He finds in autopsies on animals killed by radium emanations that the lesions consist of an intense pulmonary congestion without interstitial hæmorrhages, and without epithelial alteration. The number of leucocytes in the blood is greatly diminished, rigidity is found at the moment of death, and the heart is arrested in systole. Three hours after

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death the tissues are still radio-active. The radio-active properties of the air and of mineral waters are next considered.

"Therapeutic Effects" occupy the latter half of the book, and here we find little that is new. The author is perhaps somewhat too sanguine, and seems to have omitted all failures from his record of cases treated with radium, thus leading one to suppose radium to have a considerably greater therapeutic value than is warranted by the results of most other workers. The book concludes with a chapter on apparata for use in external and internal applications of radium. R.H.C.

* * *

LIGHT ENERGY: ITS PHYSICS, PGHYSIOLOICAL ACTION AND THERAPEUTIC APPLICATIONS. By Margaret A. Cleaves, M.D. Rebman, Ltd., 129, Shaftesbury Avenue, W.C. 811 pages, 55 illustrations. Price £1 1s.

This book will be welcomed by all who are interested in electrotherapeutics, in that it gives a full and exhaustive account of the progress and present position of phototherapy, to the literature of which it is a welcome and important addition, the subject being treated in a masterly manner. It is ony possiblel here to briefly outline the principal features of this work. The first two chapters are devoted to the physical properties of the different forms of radiation which are treated very fully, and special attention being paid to the physics of electric arc. The author goes on to discuss very fully the action of light upon elementary forms of life, bacteria and lower organisms, and gives in detail the experiments in which these conclusions are based. After a résumé of the biological effects of Light the different methods of its therapeutic application and the indications for the same are described. The chapter on the electric arc bath, which has not been much used in the country, will be read with interest as will also that on the concentrated arc, which includes a detailed description of the types of apparatus used. The effect of sunlight and incandescent electric light, simple and concentrated, is carefully dealt with, and the therapeutic value of blue, red, and ultra-violet light, their production, application, and indications contrasted. The chapter on radium contains the latest facts as regards physics and treatment.

This book, to which we hope to refer later at greater length, should be read by all who are interested in electrotherapeutics, and should certainly rank as the standard work in this branch. The author is much to be congratulated on the production of a work that gives evidence of so much assiduous work, accurate observation, and pains-taking completeness.

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NOTES AND ABSTRACTS.

ARCHIVES D'ÉLECTRICITÉ MÉDICALE,

December 10th, 1904.

Prof. Jaime R. Costa, of Buenos Ayres, publishes here an article entitled "THE ACTUAL STATE OF ELECTROTHERAPEUTICS." While perhaps not quite up to the standard of its ambitious heading, the matter contained in it is very good. Prof. Costa has obtained good results in epilation by means of X-rays, especially in cases of sycosis, favus, and herpes tonsurans; he also thinks well of their use in the treatment of tuberculous nodules even in the case of deep-seated glands. The bulk of the article is, however, devoted to the treatment of "epitheliomata" of the face; a number of photographs are given of patients before and after treatment, which show most excellent results. The majority of the cases seem to be rodent ulcers, but there are several instances of large inoperable epitheliomata, involving the greater part of the face and neck. These latter have certainly undergone a most marked improvement. The mode of operation was usually confined to the application of X-rays. For superficial growths a low tube of 2—3 c.m. alternative spark gap was used, with a higher one of 8—10 c.m. where there was deep infiltration. Prof. Costa does not take into account the "personal equation" in avoiding dermatitis, but believes that the quality of the rays and the length of application being constant, all patients may be treated alike. Where there is much horny outgrowth the H.F. spark is used in conjunction with the X-ray treatment.

Dec. 25th.—Three cases of apparent toxæmia caused by X-ray treatment are reported by Dr. Haret; these patients, a week or so after the commencement of the treatment (for carcinoma), complained of pains in the head, vertigo, palpitations, absolute anorexia, and in one case insomnia. The treatment was discontinued in one case, in the others the dose of the rays was lessened, and in all the symptoms quickly disappeared. The writer discusses the possible causes of these symptoms, and decides that they were due to a toxæmia from the rapid disintegration of the cancerous masses.

* * *

A method for electrical sterilisation of milk is reported from *l'Industrie*. Milk was submitted both to continuous and alternating currents. In the first case the milk coagulated on the electrodes; with the alternating current at 110 volts and with carbon electrodes the milk was perfectly sterilised and no coagulation was produced when the frequency was sufficiently high. R.H.C.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by CHISHOLM WILLIAMS, F.R.C.S., Ed.

The Twenty-sixth Ordinary Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on Friday, the 16th December, 1904. The President, Dr. LEWIS JONES, occupied the Chair.

Present:—19 members and one visitor.

The minutes of the Twenty-fifth Meeting were read and confirmed.

Dr. Thomas McKee of Queen's Drive, Crosshill, Glasgow, was unanimously elected a member.

The President then delivered the Annual Address.

ON THE MEASUREMENT OF THE CURRENTS IN AN X-RAY TUBE.

One great charm of electrical work consists in observing the progress towards new discoveries which is continually being made. We realise this so vividly when we review the past and the present, that we become confidently expectant of seeing the same progress in the immediate future. On the other hand we can recognise the peculiar fact that the practical realisation of an idea may take years for its accomplishment. Take the instance of the electrolytic rectifier. The notion of the aluminium cell as a rectifying device was made public more than 25 years ago. Since then it has been studied by many experimenters and some of these have written at great length upon the subject, but it is only since the commencement of the present century that the device has become available as a practical apparatus for ordinary use.

Our preconceived notions may hinder progress by leading us to believe a thing to be impracticable, or not worth trying. Nay, more; individuals can usually be found who will declare of almost any new idea that it is impossible of execution, whereas, later on, time shows that the opposite is the case. Recall the often-quoted instance of Dr. Lardner, who is said to have proved to his own satisfaction that to cross the Atlantic Ocean in a steamship was impossible, because no vessel could carry with it a sufficient supply of coal to last out the distance, and who, as it turned out by the irony of fate, was only too glad to avail himself of a steamship in order to cross the Atlantic a few years later.

In speaking of the measurement of current in X-ray work, the first thought to suggest itself is that great advantage is likely to be derived from such a procedure. Measure-

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ment is of the utmost importance. How much better our results would be to-day if all the volume of work done in X-ray therapeutics in the past few years had been done with the aid of a measuring instrument. And yet we might have been using the milliampèremeter if we had only thought of trying it. Instead of that the idea never occurred to us at all or else we thought that its use was impracticable, and a vast amount of energy has been spent upon indirect devices such as the measurement of the ampères and volts expended in the primary circuit of the coil, the measurement of alternative spark lengths, and the use of the radiochromometer, and the chromoradiometer.

The gradual growth of the idea of using the milliampèremeter in the circuit of the X-ray tube has been a feature of the year now ending. It is difficult to say when the first attempts were made. At the annual exhibition and conversazione of the British Electrotherapeutic Society, in January, 1903, Mr. Schall exhibited a milliampèremeter mounted on an X-ray tube stand, and he showed that by the employment of a spark gap in the circuit one could obtain readings of current with a direct current instrument, and that the instrument itself was unharmed by the current passing through it in spite of the high potentials concerned. He has since told me that he believes that Professor Koch was the first to apply the method. In the *Comptes Rendus* for May 9th, 1904, d'Arsonval showed a series of radiographs to prove that the intensity of the radiation from an X-ray tube is proportional to the magnitude of the current traversing the tube. His photographs were taken with tubes excited by a high potential transformer made by Messrs. Gaiffe. One of these instruments was exhibited at Oxford during the meeting of the British Medical Association, and its appearance is probably familiar to many members of this Society. In order to employ a transformer with success in X-ray work it is necessary to be able to arrest, or to divert the impulses which tend to pass in the wrong direction through the tube, for unless this can be done the tubes are injured, the photographic effects are blurred, and the measurements of current are seriously complicated. The desired result is obtained by the use of the valve tube of Villard arranged as a shunt across the terminals of the transformer. The inverse currents are thus provided with an easy path along the channel so provided, while the currents in the right direction supply the X-ray tube. The valve tube of Villard is a tube of low vacuum with one terminal expanded into a spiral form in the bulb, and having the other terminal very small and enclosed in a narrowly constricted part. It is interesting to note, in view of the remarks at the commencement of this

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address, that the valve tube of Villard has been in existence since 1899, though it has not been commercially available until quite recently.

The beauty of the effects produced by Messrs. Gaiffe's transformer apparatus, and the advantages of the Villard valve as a means of diverting the inverse currents of that instrument, have naturally led to the enquiry whether the Villard tube might not play an equally useful part in the rectification of currents whose source is the Rhumkorff coil. Most X-ray workers employ the coil to furnish the high pressures required in X-ray work, and although, in the case of the coil, the inverse current is of less detriment than it is in the case of the alternate current transformer, its presence is none the less a disadvantage in X-ray work, as well as an obstacle to correct measurement.

The reverse wave of an induction coil would be of less importance in practice were it not for the fact that X-ray tubes in general have a much lower resistance to currents in the wrong direction than they have for currents in the right direction. Thus a particular tube with a resistance equal to an alternative spark gap of three inches for currents in the proper direction, had a resistance equal to a gap of only half an inch when the current was reversed.

The use of high pressures like those of the electric light mains for the excitation of coils, also tends to increase the importance of the reverse currents. The electro-motive force of the wave induced at closure of the primary circuit is higher when the coil is excited from a high pressure source, because the growth of current in the primary is more rapid under those conditions, but the convenience of working coils direct from the electric lighting mains is so great that many of us adopt that method by preference, and would welcome any means of improving the quality of the results produced, and I hope to be able to show you that the valve tube of Villard represents an important step towards that object.

For some reason or another I have not been able to obtain satisfactory results when I have arranged the Villard valve in shunt to the tube across the terminals of the coil, and therefore I shall consider only the effects obtained with the Villard valve in series.

It is interesting to try the effect produced by arranging a Villard tube in series with an X-ray tube in such a way as to favour the current in the right direction for the production of X-rays. The effect upon the resistance of the circuit is shown by the following figures. In a given X-ray tube the width of the alternative spark gap was three inches, and this was increased by about a quarter of an inch when the valve tube was included in the circuit, but the effect of the valve tube when the direction of current was reversed was

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much greater; for working with the same X-ray tube the alternative spark length in the wrong direction when measured without the valve was less than one inch, and was five inches with the valve. When arranged as described the valve tube exercises a profound effect upon the resistance of the tube to currents in the wrong direction, and a trifling resistance to currents in the right direction. We may also learn that the valve tube is not impervious to currents in the wrong direction, for when pressed as it is by an electro-motive force capable of leaping a spark gap of over five inches, some current in the wrong direction passes through the valve and lights up the X-ray tube in the manner characteristic of currents in the wrong direction.

If the experiments are repeated with two valve tubes instead of one the resistance of the circuit to currents in the wrong direction is further increased, and a peculiar effect shows itself, and that is that the tube becomes properly, though feebly, lighted up, even when the switch is turned in the wrong direction. The reason for this paradoxical effect *is* that when the ordinary current or current of rupture is wrong in direction the inverse current or current of closure is right, and though the electro-motive force is lower in the case of the latter, it is able to send current through the tube and to light it up although the much higher electro-motive force of the current at rupture is prevented from passing by the valves.

If a moving coil galvanometer or a galvanometer with a magnetic needle is arranged in circuit with the X-ray tube its deflections throw light upon the nature of the currents traversing the circuit. If a low resistance tube be taken, one with an alternative spark gap of about an inch, the galvanometer readings indicate a predominance of the inverse current amounting to about one milliampère, and an inspection of the tube shows a marked degree of irregular fluorescence. The insertion of a valve will rectify the current which then may read about 0·7 of a milliampère in the right direction, and the appearance of the tube also becomes improved.

With tubes of higher resistance the galvanometer may give no deflection or else a small deflection of about a tenth of a milliampère in one direction or the other when no valve is used, but the introduction of the valve at once changes the readings to 0·5 in the right direction. This shows that the inverse current is still a factor which needs consideration with tubes of a resistance of about two inches of spark gap and that the galvanometer must be assisted by a valve tube if it is to give readings of any value with such a tube.

With higher tubes, which show a spark gap equivalent resistance of three or four inches, the galvanometer deflections are in the correct direction in any case, viz. both with and without the valve, but they are higher with the valve than

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without it. Readings taken in three cases have given the following figures:

A.	Without valve,	0·9,	0·25,	0·1.
B.	With ,,	1·0,	0·4,	0·3.

The appearances in the X-ray tube are clearly improved in each case. The amount of alteration produced in the galvanometer readings by the insertion of the valve tube may vary considerably with different tubes and under different degrees of working. There may even be hardly any measureable difference, especially when the tubes are rather high.

From these experiments it is clear that the valve tube is a very useful adjunct in X-ray work, because it has a marked influence in arresting the inverse currents.

It will probably prove of even greater importance by providing an easy means of obtaining measurements of the currents which generate the X-rays. There seems no doubt that the output of X-rays from a tube is proportional to the current through the tube. D'Arsonval, in the paper already quoted, gives three measurements of current, and compares their photographic effects. In one the current was 0·45 of a milliampère and the exposure was 45 seconds, in another the figures were 1·0 m.a. and 20 seconds, and in the third they were 1·25 m.a. and 15·5 seconds. By multiplying the figures for the time and the current in each case we get numbers in milliampère-seconds as follows: for the first 20·25, for the second 20·00, and for the third 20·47. The photographs exhibited were practically identical.

If in working with the coil and the valve tube in series with the X-ray tube we could feel sure that the valve arrested the whole of the inverse current, the question of measurement would be almost solved. But we are not able to assert that the valve is perfectly efficient, and therefore there may be, and probably is, a certain margin of error; and it would be very useful to know how great this is. In using a magnetic instrument the readings obtained are readings of the differences between the currents in the two directions, and the instrument therefore reads too low. Further experiments are necessary before we can say what correction to apply to the galvanometer readings to obtain accurate measurements, but it is probably not a large one. At least that is my opinion, from the following considerations: If there were appreciable leakage through one valve it should be reduced by making use of two valves in series, and the current readings should be higher in the second case, but although I have made many measurements I have not been able to appreciate any decided increase in the current from the use of two valves, certainly not so much as 0·1 of a milliampère.

It has already been mentioned that it is possible with two valves to light up the X-ray tube correctly by the currents

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of closure, although the much higher electro-motive forces at rupture are opposed to this, and the appearance of the tube under these trying conditions does not indicate the presence of more than a trace of current through the X-ray tube, except that which is producing the correct hemispherical fluorescence. Moreover, the same effect can be demonstrated with only one valve in some cases. Here is an instance. The tube used had a spark gap resistance of three and a half inches. When excited by the current of rupture the galvanometer reading gave 0·3 m.a. and when excited by the current of closure it gave 0·1 m.a., the fluorescence in each case being hemispherical, and the galvanometer deflections being in the same direction. If the valve tube were leaky to any serious extent the difference between these readings would necessarily be greater, because of the great difference between the electro-motive forces of the two waves and the consequently heavy stress upon the valve tube during the time of the discharge at rupture.

An interesting experiment would be that of comparing the simultaneous readings of a soft iron or moving coil instrument on the one hand and a magnetic instrument on the other. Here we should get a measure of the sum of the currents by the one instrument, and of their difference by the other. If the measurements were then repeated with one and with two valve tubes, the necessary data for calculation would be obtained, and the question could be settled. Within ordinary limits of work, that is to say with all tubes except those which are very high in resistance, it is probable that we shall find that the indications obtained by the aid of the valve tube and galvanometer are not very far wrong in their magnitudes, and if that should prove to be the case it will not be long before all our photographic work and therapeutic work with X-ray tubes will be measured in milliampère seconds and in milliampère minutes.

In my experiments to determine the efficiency of the valve tube for arresting the reverse currents I was much puzzled for a time by continually seeing an image of the anticathode upon the fluorescent part of the tube. This image is generally brighter than the rest of the fluorescent hemisphere, and I felt at first that it must be a sign that the discharge was not purely unidirectional, but eventually I was able to satisfy myself that this was an error, for by connecting the tube to a static machine, with which there could be no question of reverse current and which gave no sign of oscillating discharge, I found that the peculiar image referred to was still present, just as was the case when the tube was excited by a coil. Although I am not able to give a proper explanation of the phenomenon, I now recognise that it is not an effect of reverse currents. The appearance here referred to is probably familiar to most workers with X-rays.

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MEDICAL

Electrology and Radiology.

No. 2. FEBRUARY, 1905. Vol. VI.

EDITORIAL.

In an article entitled "The Intrusion of Laymen into Medical Practice," the *British Medical Journal* of February 4th comments on Mr. Shenton's letter in our last issue. The writer refers to a previous communication, in which it was stated that the high fees charged by the medical men engaged in electrotherapeutics are the main cause of the difficulty experienced by them in competing with their unqualified rivals for this work. The remedy suggested was that medical men should detail the work to nurses or trained but unregistered persons acting under their supervision, and reduce their fees, and this arrangement being advocated for some branches of the work, presumably only for some forms of treatment.

We feel, however, that while certain of the more unskilled processes of medical treatment must of necessity be entrusted to unqualified hands, yet that this should be as far as possible minimised. The recent action of the General Medical Council in abolishing unqualified assistants in general medical practice, shows that this view is held by the profession at large, and we should like to insist that the application of electrical currents constitutes a branch of medical practice, and that it is as undesirable to entrust this work to unqualified and consequently irresponsible persons, as it is to entrust to them the administration of drugs.

In may be contended, and it will be contended, that it is sufficient for the medical practitioner to prescribe in exact detail the electrical treatment required; but it would be equally logical for an anæsthetist to entrust the administration of an anæsthetic to such a person after he himself had pre-

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scribed the quantity of chloroform to be used, and the method of its application. If electrical treatment is to be rescued from the hands of the charlatan it must be clearly recognised that its application requires constant supervision and adaptation to the needs of the particular patient. The average nurse is quite capable of applying the ordinary interrupted current in most cases; but it must be remembered that in her hospital course she has not had more than the most elementary training in physics, and the training that she has had has been entirely theoretical, also that her knowledge of anatomy is rudimentary, so that she is not able to carry out the work in anything but an empirical manner.

With X-ray work two points have to be considered: firstly, as regards treatment there can be no two opinions, the work should be in the hands of experts, *i.e.*, either of men who have made this a distinct speciality, or of practitioners who have devoted serious study to the subject, just as the practice of medicine is in the hands of consultants and general practitioners; secondly, in skiagraphy two processes are involved, firstly, the mechanical production of the skiagram. Even here the knowledge of anatomy and surgery, which can only be obtained by a full medical course, is of the greatest value in procuring an intelligently taken picture. This part of the process some may desire to entrust to unprofessional hands, mainly for financial reasons. Skiagraphy will always be somewhat expensive, but this disability it shares, for example, with surgery. But there are installations at practically all hospitals, and there is no evidence that the medical men engaged in X-ray work are less willing than their surgical colleagues to moderate their fees in appropriate cases.

There is the question of the interpretation of the skiagram. Here, of course, the value of expert advice is paramount. This interpretation is by no means as simple a matter as it appears at first sight. For example, we should venture to think that on being shown as perfect a skiagram as can be obtained of a small renal calculus, few who are not familiar with these cases would care to advise nephrotomy on the strength

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of their interpretation of the negative. It is for this expert opinion that experts' fees are claimed.

The case is somewhat parallel to that of a patient with defective vision. He may go to an "ophthalmic optician," and obtain a pair of spectacles for a few shillings, which may or may not suit his case, but he would be much wiser to consult an oculist, who, it is true, may prescribe exactly the same glasses, but yet will only do so after an exhaustive examination of the patient's eyes. His fee is higher undoubtedly, but the patient has escaped a risk, and has the assurance that the glasses are all that are needed, and that there is no insidious disease behind.

It is an easy matter for the oculist to write in his case book, "Fundus—normal," but it has taken much study to enable him to arrive at this conclusion. It sounds equally simple to say that there is "no bony lesion," but it requires considerable training to be able to say this with conviction.

We think it is only fair that those who devote themselves wholly or entirely to this branch of medical work should receive the support of their professional brethren, and we feel sure that the intelligent appreciation of their work is in the best interests of patient and practitioner also.

Skiagraphy is of especial value in those cases in which physical examination by all other known means is insufficient, and it is just those cases in which the opinion of an expert is needed. Gross lesions of bone can be diagnosed by any competent surgeon by ordinary methods, and the skiagram is useful only in demonstrating to the patient what the surgeon already knows.

As the development of surgery as a science has removed it from the hands of the barber and earned for it an undenied position in the eyes of the profession and of the public, so we may claim that electrotherapy has earned for itself a similar position, the complete recognition of which is only a matter of time.

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MEDICINE AND THE IONS.*

By STÉPHANE LEDUC, M.D.

Professor of Medical Physics in the Medical School of Nantes.

When continuous currents are applied to patients, the effects produced at the moistened electrodes vary considerably with the nature of the special ion introduced. It is very interesting to examine the effects produced by different ions, and the subject is one which has only engaged attention in recent years. I have already published papers on this subject before the Congress of the French Association for the Advancement of Sciences, at the meeting held at Paris in 1900, and at the meeting held in Corsica in the following year, and again at subsequent meetings.

As a matter of fact, the use of electricity as a means of introducing drugs into the system, was practised before any exact explanation of its action had been devised. Cases of scrofula, which had been cured by the electrical introduction of iodine, were reported as long ago as 1846, and other cases of the same kind were reccorded in 1855. In 1886 Wagner first recommended the use of cocaine for the electrical treatment of neuralgia, and Gärtner and others had introduced mercury into the system of a patient by means of electrodes in the forms of baths, and had proved conclusively that the mercury entered the body. Edison also recommended the introduction of lithium for gout. I might enumerate a much longer list of medical applications of electrolysis, but this list is sufficient to show that the progress which is now being made in the theory of the method is certain to give rise to many new applications of it in the future.

The effects due to the transport of ions can be divided into two classes, general and local. With regard to the general effects, I need only mention that general effects on the system can be produced by this mode of procedure, and that they may lead to useful applications. For instance, I have demonstrated that the ions of strychnine and of cyanogen can be introduced into the body of a living animal in poisonous doses, and I have been able to produce symptoms of poisoning in my own person by means of morphia introduced in this way.

By using large electrodes, as for example, in the form of arm or leg baths, it is possible to employ the electrical method even with drugs which require to be administered in considerable doses, as for example with iodine. Or again,

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* Abstract of a paper read at the Congress of the French Association for the advancement of Science, held at Grenoble, August 1904.

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with large electrodes applied to the surface of the limb or of the trunk, currents amounting to 100 or 200 milliampères can be used, and in either of these ways considerable quantities of drugs can be introduced into the system in a short time.

It is not correct to assume that the effect of drugs introduced into the system electrically, in the ionic form, must be identical with that produced by their administration through the mouth or by subcutaneous injection, at least there is one point of difference which may be of importance, viz: when administered in the ordinary way the drugs are added to the constituents of the body; when administered electrically they are substituted for the normal ions of the tissues. The method is therefore a method of substitution, rather than one of addition.

It may also be borne in mind that electrolysis can be made use of for the purpose of extracting from the body such ions as are injurious. Frankenhauser for instance, has given experiments to prove that ions can be made to leave the body in this way. Poey and Engel have used electricity as a means of eliminating poisonous metals from the tissues, and Bordier has shown that the ion of uric acid can be extracted in appreciable quantities by means of an arm bath used as the anode of an electric circuit, and Behring and his pupils have suggested the possibility of the elimination of toxins by an electric method.

In general, the effects produced around the electrodes are due to the transport of ions, and care should be taken to employ pure solutions when the effect of any special ion is desired, as otherwise the effect looked for may not be obtained. Distilled water should be used, and the tissues covering the electrodes should contain no foreign substances. I prefer to use pure absorbent cotton-wool, which answers the purpose very well. When possible the metal plate employed for the anode should be the same as that of the metal in the solution. If this is not possible, the metallic surfaces must be covered with numerous layers of tissue to prevent the case from being complicated by the introduction of ions liberated from the metallic surfaces, and in such cases I employ at least 16 layers of cotton tissue for the covers of my electrodes.

Sometimes it is useful to circumscribe the area of application by means of a layer of gutta percha tissue placed beneath the electrode, and having an opening cut in it which corresponds in size and shape with the portion of skin which it is desired to treat.

The local effects of ions are a good deal more interesting than the general ones. To my mind these local effects are of such importance that I believe the time will come when we shall consider many of our present procedures of drug giving to be absurd. I mean those procedures in which we desire to

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act upon one portion of the body only, and yet are compelled to fill the whole of the body with some drug given by the mouth for the sake of its local action, although the effect which it exercises upon the body at large may be undesirable or even injurious. It has been shown by Professor Bouchard that it would be a rational procedure to replace general treatment of this kind by local treatment whenever local treatment can be managed. The electrolytic transport of ions manifestly supplies us with new methods of obtaining this object. By its means we can introduce any one of a series of ions into the actual protoplasm of the cell, in spite of its power of resisting the entry of foreign material, and we can be sure of obtaining from each ion its own special action at the place where we introduce it.

When we reflect upon the variety of ions, and consider the depth to which we can make them penetrate, we can see how ineffective it is to be content with applications of ointments or of liniments, to the mere surface of the body, as a means of producing topical effects. Such things act only in a superficial manner, and the amount which actually penetrates into the tissues is only a minute fraction of the quantity applied to the surface. It is true that absorption does take place, but this occurs chiefly with highly diffusible compounds, which pass quickly into the general circulation, and are carried quickly away from the seat of their introduction. Many valuable drugs penetrate either with great difficulty or not at all when applied in the old-fashioned way, but electrolysis introduces them with ease to any required depth. It the hair is shaved off from two areas of the skin of a rabbit, and a pair of electrodes imbiled with a solution of bichromate of potash are applied, and a current be passed between these electrodes with a density of two milliampères per square centimetre for 40 minutes, the following results will follow. At the anode the ion which penetrates is that of potassium, and it produces no appreciable change, either immediate or remote, while at the cathode, where the chromic radical has penetrated, the skin is turned red, and a zone of congestion is produced, and this is duly followed by the development of a superficial slough, which clears off in the course of about three weeks, leaving behind it a new formation of skin or of scar tissue, according to the duration of the original application.

When the electrodes are moistened by simple acid solutions which are not concentrated, the effect upon the skin at the anode is that which is due to the introduction of the ion of hydrogen, and the effect for all ordinary acids is identical. With dilute alkaline solutions we introduce the ion hodroxyl at the kathode, and the effect in this case is as definite and precise as in the former one. In each case the

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sore produced by a long or strong application has its own peculiar characteristics. The ions of potash or soda or magnesia do not produce any very definite effects except when introduced in large amount. The ions of the metals of the alkaline earths on the other hand produce, if given in sufficiently strong doses, a characteristic destruction of the surface of the tissue. Dogs upon which I have experimented with solutions of calcium chloride, were able to endure a density of current of 15 milliamperes per centimetre for thirty minntes without discomfort. The surface at the anode then seemed white, as though impregnated with calcium carbonate, sulphate or phosphate. Subsequently inflammation and œdæmatous swelling set in, and this changed into an ulcer with an indurated base and undermined edges, which gradually healed, preserving its character of induration for more than a month. Barium and strontium compounds act in the same manner.

Of all the ions with which I have experimented, the one whose introduction appears to be the most painful is the ion of carbonic acid; this is an ion which exists in large amounts in the tissues of the body. I have found it very difficult to study its effects on account of the pain caused by attempts to introduce it. The ion of sulphuric acid has the special effect of producing a smooth hard dryness of the surface which is readily recognised.

Of the heavy metals there are many whose ions are more or less caustic, probably because they coagulate alluminous substances, but the one which is of most interest from a medical point of view is the ion of zinc. This ion is an antiseptic of the first rank, and when applied electrically, it can be made to penetrate the tissues of the skin to any desired depth. There is no wound or ulcer which cannot be disinfected by its employment, provided its surface can be reached by the electrodes. One of its peculiarities is that it provokes but little inflammatory reaction. When I have experimented with zinc upon the skin of animals, and have caused superficial or even deep ulceration, I have observed that the wounds produced show no inflammatory effect nor sign of infection from germs even if they are left completely uncovered—on the contrary they remain aseptic, so that it appears as if the ions of zinc which they contain serve as the best possible of antiseptic agents. Although I have examined the ions of many other metals I have found none other so interesting or so valuable in this respect as those of zinc. Zinc ions should be used in the treatment of chronic ulcers, sinuses and fistulæ, the method is far preferable to curettage which manifestly has risks of setting free the infective agents, and of admitting them into blood and lymph channels of the part operated on. Zinc electrolysis may be

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used in the treatment of rodent ulcer, or will give results which in my opinion, are likely to be even better than those obtained by the use of X-rays.

Some of the more complex ions of organic compounds can also be made use of in electrolytic applications, as for instance, adrenaline, cocaine, and others. With cocaine anœsthesia of the surface can be produced in five minutes with a current of small density, but its practical employment in this way requires discrimination because irritation of the skin is apt to follow with redness, and later desquamation and a brown discoloration which persists for a considerable time. It is interesting to note that cocaine introduced in this way diffuses away very slowly from the point where it is introduced.

Salicylic acid is another body whose ions seem well tolerated by the tissues. Very little local inconvenience follows its introduction. I have used it successfully in the treatment of dry pleurisy. A large pad soaked in a two per cent. solution is applied to the whole of the affected region, and a current of 100 milliamperes is caused to flow for half an hour. After the application the skin has a uniformly red appearance, but in almost every case in which I have tried this remedy the pain and the shortness of breath have disappeared, and the patients have declared themselves more benefitted than by any other kind of application.

Other writers have demonstrated the good effect of the salicylie ions in cases of chronic rheumatism.

Chlorine ions seem to have a marked effect in producing resolution of scar formations and of thickened tissues. By means of them stiff joints can often be rapidly cured without the need for painful wrenching movements, and under the electrolytic treatment one can see the stiffness disappear gradually from day to day, and the affected joints recover their original power of movement. This result has been noted by myself on many occasions. It is of primary importance that the disease which originally produced the stiffness shall have disappeared and that no active inflammatory process be in progress at the time of the treatment. The best procedure for obtaining this softening of scar tissue is to use a one-per-cent. solution of common salt as the electrolyte, and to apply the cathode to the affected region. Under this pole the tissues receive chlorine ions and part with the ions of sodium, and these exchanges seem to modify the chemical constitution of the tissues in the way best adapted for the softening of adhesions and cicatricial tissue. I can quote a case where a stiff wrist of six months' standing, the result of phlegmonous inflammation, had resisted many kinds of treatment, including forcible movements under an anæsthetic, but recovered free movement after two applications of the electric current.

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Cases of stiff knee have also, in many cases, become quite free after a few applications of this method. The more accessible a joint is the more easily the results are obtained, and for this reason greater difficulty is found in the treatment of ankylosis of the hip or the shoulder joints than of such joints as the knee, the wrist, or the ankle, which are less covered by layers of the soft tissues.

Certain rheumatic affections of the eyeball may also be treated by means of an electrode applied over the closed eyelid. Cases of scleritis and episcleritis, usually regarded as rheumatic affections, yield promptly when treated by applications of the negative pole through the closed eyelids, with a current of from five to ten milliampères, given for five or ten minutes, according to the toleration of the patient.

ON WHAT LINES IS THE TREATMENT OF MALIGNANT DISEASES ADVANCING?—Abbé in an article with the above title adduces evidence to show that while there is much that is discouraging in our results in the treatment of malignant disease, undoubtedly progress has been made in three notable directions, viz. : (1) In the recognition of the principle that carcinoma and sarcoma are primarily of local origin. This makes the cure almost certain when very early operation is done; (2) In recognising the enormous value of increasingly extensive operation in advanced cases, widening the field of skin removal and lymphatic dissection; (3) In establishing the value of radiotherapy. He regards the prospect of radiotherapy as hopeful, and believes that it furnishes a type of external stimulus heretofore unused, which adds a measure of strength and control to the vital spark left in the decadent cells of the morbid growths.

Ultra-violet energy is without value in true malignant growths, but such is not the case with the Röntgen ray, what he terms the ionizing rays and radium rays. The greatest future results are to be had, he believes, from radium, because of the ability to carry it within the diseased tissues. Abbé's experiments show microscopically that a lethal effect on the nests of cells constituting the tumour is produced both by Röntgen and radium radiations. Abbe finds that the electric spark from the coil between iron electrodes, rivals both the Röntgen and radium rays. —*Med. Record*, December 31st, 1904.

Remark.—It is this spark which is the source of the ionizing rays of which he speaks, the results obtained are due to the ionizing action of a condensor spark, by means of which there is an actual destruction of tissue, a burning out as it were of the cancer or lupus nodule. This condensor spark arcs itself between two small metallic terminals, attached to an insulated handle constructed as is the handle of a cautery instrument. In this way it is possible to localize the energy from this condensor spark upon a lupus nodule, in a laryngeal malignant node, or upon a cervical cancer.—THE AMERICAN EDITOR.

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CHRONIC X-RAY DERMATITIS, AND CANCER.

By J. Hall-Edwards, L.R.C.P.,

Medical Officer in charge of the X-ray Department at the General Hospital, Birmingham.

In the recent discussion on Chronic X-ray Dermatitis, it has been taken for granted that this disease is synonymous with cancer, and that sooner or later it will develop into a lesion of a truly malignant type. Despite all the statements made, and the assumed histories of the cases with which the contention has been backed, we have before us no real evidence that all cases of X-ray dermatitis develop into cancer. As a matter of fact we have not as yet had placed before us the true and authenticated history of a single case. What we have heard has largely been the result of guess-work, or newspaper gossip, and as such may be entirely disregarded as having no scientific bearing upon the subject.

Throughout the world there must be many hundreds of sufferers from chronic X-ray dermatitis, in various stages of the disease, yet we have only heard of three cases which have, on the above-mentioned slight evidence, been pronounced as being of a cancerous nature.

Medical men, from the very nature of their calling, run considerable risks of contracting disease, and a medical X-ray expert who has contracted an incurable dermatitis runs risks infinitely greater than those run by the operating surgeon, or even by the gynæcologist. This is more especially the case if the X-ray expert's time be much taken up with treatment. The nature of the disease (split and undermined nails, and warty growths) precludes the possibility of effective disinfection of the hands, and the daily handling of numerous horrors, in the way of diagnosed and undiagnosed skin diseases, renders his vocation an exceedingly precarious one.

It is now well known that every form of X-ray ulceration presents numerous difficulties in the way of cure, and that, even in the most perfectly aseptic surroundings, such an ulceration takes a considerable length of time to heal, even in the face of persistent scientific treatment; given such an ulceration and a continuance of work, the chances of contracting an infective disease of a phagedenic or erysipelatous nature must be great indeed.

I will not argue that chronic X-ray dermatitis may not be a predisposing cause of cancer in subjects prone to that disease, but the dermatitis in itself is certainly not of a cancerous nature, although it may possibly be safely described as pre-cancerous.

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Mr. Mayo Robson, F.R.C.S., in his admirable "Bradshaw Lecture,"* has given us the very essence of the up-to-date views of modern methods of dealing with cancer. He has insisted upon cases being operated upon in the precancerous stage, and has shown that in a large majority of cases, the removal of the cause will stop the effect. These teachings are not new, but the masterly way in which he has dealt with the subject may have an effect in bringing about a more emphatic insistence upon early operative procedure.

In speaking of pre-cancerous skin conditions, Mr. Mayo Robson said, "nearly all cases of skin cancer occur on exposed parts of the body, face, hands, genitals, or nipples, and on surfaces where there has been some lesion, such as warts, eczema, sebaceous tumours, ulcers, scars, etc.

"Where such tumours or spots are in a position that renders them liable to irritation they should be excised, but whatever their situation, if they begin to enlarge, it is certainly wise to remove them before the onset of malignant disease to which they are prone."

To the victims of chronic X-ray dermatitis the above statement must have a particularly perturbing effect, for it is impossible for them to excise the hundreds of pre-cancerous foci which cover the backs of their hands. It is now too late to take the advised precautions, but whilst there is life there is, even in the face of apparently unsurmountable difficulties, at least a little hope.

To those workers who have not as yet contracted a dermatitis, and to beginners, I must emphasize my previous advice, that every means possible should be taken to prevent the contracting of a dermatitis. In dealing with penile cancer, Mr. Mayo Robson has shown that as a means of legislative procedure, chimney-sweepers' cancer has been prevented. He says:—"The prevention of penile cancer among Jews is the result of a religious rite, for phimosis is the chief predisposing cause of cancer of the penis, and if circumcision were carried out among the Gentile population it would doubtless have the same beneficial effect." I believe that by the constant wearing of gloves which are impervious to the rays, and by taking precautions to cover up the tube with the exception of the necessary window, all danger of contracting a dermatitis may be prevented. Whilst it is an undoubted fact that constant exposure to the X-ray may result in the production of a pre-cancerous disease, it is still more astounding that a modified application of the rays will cure pre-cancerous and superficial cancerous conditions.

There are a number of persons who, having pre-cancerous lesions, object to operative procedure. In many such cases

* *British Medical Journal*, Dec. 3, 1904.

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I have been enabled by means of the X-rays to cure the condition, and (I trust) to remove the liability to cancer. I hope to publish a number of such cases shortly, and to prove that in the X-rays we have a therapeutic agent for the cure of (at any rate superficial) cancer, which offers possibilities far ahead of any as yet offered by any therapeutic measure.

It would be out of place in such a paper as this to discuss at length the effects of the X-rays upon cancer, but I cannot refrain from stating that in my humble opinion, an unbiased investigation into the effects produced would lead to renewed efforts being put forward, not only to discover the means by which the good results are brought about, but would inspire workers to continue their good work with increased energy. Personally I have no fears, I see before the X-rays a more than notable future in the treatment of cancer.

DIET.

THE YOLK CURE IN THE TREATMENT OF THE UNDERFED.—According to Dr. Heinrich Stern the yolk cure affords a dietary regimen exhibiting all the advantages of a nutriment of the first order, without its usual drawbacks. Stern employs either a rigid yolk cure, in which the greater portion of calories is yielded by the yolk of the hen's egg, and in which the latter forms *the* only fatty substance, and modified forms in which various combinations are introduced. In the raw or half raw state, the yolk is readily digested, well assimilated, and is well borne and liked by most individuals. It contains a diastatic ferment, stimulates gastric secretion, contains lecithin, and is very useful in diabetic cachexia or diabetes complicated by acetonuria. Practical directions are given by the writer as well as a specimen daily menu in which 15 yolks are incorporated in various easily digestible dishes.—*New York Med. Record*, December 31st, 1904.

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NOTES AND ABSTRACTS.

LEUCÆMIA.

Leucæmia.—Dock gives the results of an examination of 29 cases and mentions several more not fully reported. Two patients had acute lymphatic leucæmia, they died too soon to furnish conclusions. Two had subacute lymphatic disease and both died, but in one longer under treatment there was temporary improvement of blood, glands, and spleen. Of five patients with chronic lymphatic leucæmia two died, three were much improved, the leucocytes reaching normal numbers. There were 21 cases of splenomedullary disease only 18 of which were available for analysis. In 11 the leucocytes fell to or below 12,000: in 7 they did not go below 31,000. The methods of treatment varied greatly and good results followed treatment of the spleen, epiphyses of long bones and sternum. It took from one to six months to get the best results. The myelocytes rarely disappeared and in some cases continued in large proportions. Aubertin and Beaugard are the only authors who describe the minute changes in the blood; the red blood corpuscles are often increased, sometimes notably, the large lymphatic glands and spleen diminish, the spleen becoming impalpable in three cases; the general effects were often striking. When the strength increased, ascites and œdema disappeared and all patients were able to return to work, no case however, could be said to be really cured relapses have occurred, and five patients with splenomedullary leucæmia have died. In several of these, as well as in some others, there were toxic symptoms such as chills, fever and anorexia. The mode of action it is impossible to explain at present. The change so far seems a functional one, but treatment at earlier stages may be more radical, so far it has not given better results than arsenic or some bacterial products but it seems more certain than arsenic. Careful observations are much needed with known conditions of current strength and study of the blood and every change in the body. *Brit. Med. Journ.*, Jan. 28th, 1905.

X-rays in early diagnosis of Pulmonary diseases.—Green concludes that in these methods the diagnosis of early cases is made more easily and more certain, while the progress can be watched. He holds that not only is unilateral limitation of diaphragmatic movement the earliest sign of Pulmonary tuberculosis, but if the history and treatment are taken into account, the movement of the diaphragm may be taken as a measure of the activity of the disease. The presence and amount of the fluid in the chest can be noted and it is also possible to state whether air is present in addition to the fluid

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or not: in the former case the limit of the shadow is horizontal; in the latter, under the same conditions, the shadow has formed a concavity, the sides of which are prolonged upwards for a considerable distance.—*Dub. Journ. of Med. Sc.*, Oct. 1st, 1904.

Electrolysis of Urethral Strictures.—Herdman in a lecture on this subject states that negative electrolysis may be used in all cases, it making no difference whether there be one or several strictures, but in no case should the current used be strong enough to produce burning, since cauterisation causes cicatrical tissue which reinforces the already narrowed channel. A current of 3 to 5 milliampères is sufficient. From the results of hundreds of cases it is safe to say that 80% are permanently cured. The problem before us, in the use of electrolysis, is not to cauterise or destroy any tissue whatever, but simply to soften and, by stimulation, cause the softened tissues to be absorbed. The advantages of electrolysis are:

1. There is no danger in its use.
2. The patient is not confined to bed or detained from business.
3. It relieves at once.
4. There is no relapse.
5. It is not followed by hæmorrhage, fever or other unpleasant symptoms.

As the stricture becomes larger the size of the electrode may be increased. Average number of treatments 5 to 10, extending over two or three months. Length of treatment three to eight minutes.—*Indian Medical Record,* Sept. 7th, 1904.

Carcinoma of the hard palate, successfully treated by radium.—Perugia reports a case of a man aged 67 who, at the beginning of last April noticed a lump on the left side of his palate which grew rapidly in the succeeding two months, so that it came to fill almost all the lower half of the palate and was very painful. The radium used was not very powerful, 30 applications in all were given, varying from 10 to 20 minutes. At the end of October there was no trace of the tumour, which at the commencement of the treatment was three centimetres in longitudinal diameter and 2·6 transversely. The man had put on eight kilograms in weight. A small portion of the tumour was removed for examination and found to be true carcinoma. At the present time the patient remains very well and there are no signs of relapse, no other treatment was adopted while the radium was used, and, except a slight erythema, no inconvenience was experienced. The author believes this was partly due to the use of weak radium, and beginning with sittings of short duration.—*Gazz. degli Osped.*, Jan. 1st, 1905. *Anal. in Brit. Med. Journ.*, Feb. 4th, 1905.

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Röntgen Therapeutics.—Holzknecht, describing the action of X-rays divides the tissues into the following classes :—As very sensible: lymphoid tissue, the skin modified by psoriasis and mycosis fungoides. As sensible: skin modified by inflammation, acne, sycosis, lupus and epitheliomatous tissue. Moderately sensible: healthy epidermis and its appendages. Very little sensible: connective tissue, vessels, etc.

The intensities of reaction he divides into four classes :—First degree: latency about three weeks ; process of degeneration without inflammatory reaction, integrity of the skin. Second degree: Latency about a fortnight: same phenomena as above, but in addition inflammatory phenomena without vesication, the skin recovers its integrity without scarring. Third degree: latency about a week ; same phenomena as above, plus vesication and exfoliation ; the skin becomes recovered with epidermis, but is discoloured and later shows signs of atrophy. Fourth degree: latency about half a week ; same phenomena as above but with necrosis ; cicatricial tissue is finally formed, but often after the skin has several times been temporarily recovered with epidermis.

From the Therapeutic point of view one has usually to reckon with the first and second degrees, but also in the case of malignant growths, with the third and fourth.

Treatment he recommends to be conducted by means of a single maximal dose ; this he finds sufficient for the treatment of numerous maladies including some cases of rodent ulcer, mycosis fungoides, and favus. For other affections, however, in which success is not obtained by a single application (lupus, scrofulo-dermia, hypertrichosis), a second application is given when the reaction has ceased, that is to say after an interval of 4 to 7 weeks.

In concluding his paper he remarks on the surprising effects of radiotherapy on leucæmia, stating that one single irradiation of the spleen, liver, long bones and hypertrophied glands, in 2 to 3 weeks brings back the number of blood corpuscles to normal, at the same time relieving the general condition.—*Archiv. d'Elect. Méd.,* January 10th and 25th, 1905.

Therapeutic Experiments with Electro-magnets (Cohn).

Some years ago Muller made some experiments with certain kinds of electro-magnets and noticed that the people at work with these experienced a beneficial therapeutic influence. Cohn has just taken up the subject again and publishes the results of his researches. His system is composed of an interrupted current passed through a coil, the core of which is made of plates of galvanized iron. The

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polarity of the magnet is reversed about 100 times a second, paramagnetic substances such as iron are attracted by the current, whilst diamagnetic substances, as aluminium, are repelled. The influence of this magnetic field has been studied by several observers, and they have stated that it has absolutely no effect on the nervous system, and that on approaching the instrument the eye perceives a vibratory movement, which usually disappears when the eye is closed. Cohn has tried the effect of these electro-magnets on a certain number of patients, treating neuralgia, neuroses, joint affections, Thomsen's disease and chlorosis. The currents are applied for from 3 to 15 minutes once or twice a day, "suggestion" is avoided. With 30 recorded cases, the method was useless in the case of 12; these patients suffered from trigeminal brachial or intercostal neuralgia, hysteria, congenital myasthenia, and various neuroses. In six cases (tic-douloureux, hemicrania, sciatica, spermatorrhœa, and rheumatism) there was a passing amelioration. Four cases, however, were greatly improved; these patients were suffering from neuralgias and nervous insomnia. The results appear to be the same as those given by Tesla's currents, and the author believes that electro-magnets must be regarded as almost devoid of therapeutic action.—*Archiv. d'Elect. Méd.*, Jan. 10th, 1905.

A. Moutier and A. Challamel report fifty cases of arterial hypertension treated with high frequency currents; most of these patients were old men of ages ranging from 70 to 85, who were suffering from arteriosclerosis, the arterial tension before and after each treatment was measured from the radial pulse in centimetres of mercury. In each case pressure was reduced to normal, which was taken at 15 centimetres. Even after prolonged treatment they never noticed a reduction below the normal. In all cases at the end of the first application, a fall of 3 to 7 centimetres was observed.—*Ann. d'Electr. et de Radiol.*, No. 6, 1904.

R.H.C.

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DIGEST OF CURRENT AMERICAN LITERATURE.

SOME ASPECTS OF PHOTOTHERAPY.

Under the above title, Dr. Charles R. Dickson considers at some length the physical characteristics and physiological action of various sources of light energy, emphasizing especially the value of iron arcs.

The lack of penetrability of the short and high frequencies of ultra-violet light, in which iron arcs are so rich, is to a very considerable extent compensated for by the removal of obstacles to penetration, or by modifying their condition. The epidermis, scales and crusts, chiefly by their yellow colouring, and blood on the surface or circulating in the capillary vessels, due to its red colour, are obstacles to penetration. By thoroughly cleansing the tissues and rendering them anæmic by the use of adrenalin chloride solution, or by compression with ice or rock crystal, the effect of the rays will be apparent for some distance beneath the surface.

Dickson notes the well-known analgesic action of ultra-violet rays and their power to relieve the pain of cancer (epithelioma) superficial neuralgias, and the itching of epithelial neoplasms benign as well as malignant. He finds them very useful in the healing of superficial abrasions on the hands and fingers of surgeons where dressings are inconvenient, and an abraded epidermis is a constant menace to safety. In such conditions he finds it rarely necessary to repeat an exposure of 10 minutes. All signs of inflammation, if present, will have passed away by the following morning, or in the course of a few hours after exposure.

In angiomata where the vitality is below par, he finds exposure to the energy of an iron arc of value preparatory to the use of electrolysis. He also uses them to promote the tone of issue which is breaking down under X-raying or is exhibiting too marked a tendency to do so. He finds them then not only important adjuncts, but of value preparatory to the employment of the X-ray. They are of great value in scar tissue after electrolysis, caustics or the X-ray. Cases of acne rosacea are reported improved, acne vulgaris and chronic eczema cured. A case of pemphigus, lad, aged 9, trouble since infancy. Malassimilation had been a prominent feature, and was ascribed by the parents to the use of sterilized milk of the cow. From six weeks of age skin had been irritable, and the child had been under medical care from birth, at the hands of eminent surgeons, dermatologists, gastrologists, etc. Internal and external medication had been tried in most varied forms with little tangible result. The condition of the skin, mucous membranes, nails, etc., of this patient was typical of an extreme type of the disease. Improvement began with the first exposure. Five exposures only were given in the course of four weeks, when an attack of diarrhœa supervened. Five months later treatment was resumed because of a slight recurrence in the heels, toes, and fingers. With the exception of

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those localities, the skin was in a healthy condition throughout, a profusion of downy hair covered the scalp, and the eyebrows and lashes were reappearing, while the child walked quite well unaided. Two subsequent exposures were made when the child was taken away for the summer. There was practically no evidence of the disease left, although treatment was to be carried out later. Dickson has also used the iron arc successfully in sycosis, furuncle and carbuncle before the period of suppuration. In the latter condition, an exposure of eight minutes sufficed to abort the carbuncle, and also to blister the skin.

In a carbuncle on the side of the neck which had undergone incision, antiseptic poulticing, removal of sloughs and dressing, healing was complete, when two other carbuncles appeared on the upper margin of one of the scars. After the application of a solution of adrenalin chloride, the parts were exposed to the iron arc rays, on successive days for ten minutes each, with the result of complete disappearance of the carbuncles, and no tendency to recurrence was manifested.

An extensive cellulitis with pus oozing from nine points of discharge was favourably influenced and would have unquestionably recovered had the patient continued treatment.

Other conditions are reported cured or improved, and Dickson concludes that the rays of the iron arc have a therapeutic value of their own.—*Advanced Therapeutics*, January, 1905.

The following case which occured in the writer's practice is very prettily illustrative of the action of the intensely chemical energy of an iron arc.

TERTIARY SYPHILIS.—December 21st, 1904. Mrs. W., age thirty, married ; no children, never pregnant. Father living, age seventy-three ; mother dead at fifty-three, "Menopause." Patient one of eight children, all well. Health always good ; well at time of marriage and since, until the present trouble. Husband is also in good health, but had an operation for hæmorrhoids five years since. In June, 1903, patient wakened with eye swollen. Physician called, and was under his care for three months. The tissues about the eye were swollen and red, but she suffered no pain. The diagnosis made by physician in attendance was that of poisoning from insect bite. In August, 1903, the swelling under the eye was opened, discharging pus freely. In December, 1903, she was operated on for a "fistulous opening underneath the right eye." In May, 1904, she began to have trouble with her nose. Noticed it was very much swollen. It grew gradually worse. In October a large ulcerated sore appeared on the upper lip. On December 20th, when first seen, bridge of nose broken down ; septum perforated, ulceration of left nasal cavity, characteristic discharge. Lip swollen, indurated, dusky red ; ulcerated area of size of nickel. Hole with clean-cut edges into which forefinger could be laid. Discharge. Sluggish circulation. At the time of coming under care the patient had been on mixed treatment for over two months, and had also had from twelve to fourteen exposures to the X-ray at intervals of two days. Each X-ray exposure was followed

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by the use of the brush discharge from a static machine. Very little improvement, if any, was noticed from the combined use of the X-ray, brush discharge, and mixed treatment. December 21st, 1903, patient came under the author's care, and treatment by means of the chemical frequencies of light was instituted.

The water-cooled iron electrode lamp, modeled after the one devised by Sophus Bang, was used. Treatment was given twice a week only. Before each treatment the lip was carefully freed from the crusts due to the discharge from the ulcerated area and from the nose by the use of a peroxide of hydrogen solution. Firm pressure was made upon the part with the compressing lens of the lamp to secure the necessary anæmia, and the light applied at the first sitting for five minutes only; subsequent exposures were ten minutes each in duration. Slight reaction was established by first exposure, marked from second treatment, followed by diminution of induration, swelling, and discharge. The sore began to take on a healthy appearance, and at the end of three weeks was absolutely healed, only a slight redness of skin was noticed. At the end of the fourth week this redness had passed, and the skin was smooth, of normal colouring, and without any indurated scar tissue whatever There was a modification of the discharge from the nose with the healing in the lip, but treatment was directed to the nasal cavity after the healing process was established in the lip. At first, the light from the marine searchlight was projected into the nasal cavity. With the establishment of improvement, a small incandescent light was carried directly into the nares and kept in position for five minutes to each naris. Three such exposures were made, with the result of cessation of the nasal discharge and healing of the mucous membrane around the perforation. At the time of her last visit, January 28th, 1904, the nose, as well as lip, was absolutely well. There remained the white and glazed appearance of the nasal mucous membrane about the perforation and the deformity, to testify to the nature of the condition from which she had suffered. The interesting features of this case are: (1) The history. If the patient is to be believed, the infection came from an insect bite; (2) the infrequent treatments, but two a week; (3) the improvement in the nasal ulceration, as evidenced by the lessened discharge and appearance of the mucous membrane from the application of light to the lip only; and (4) the intense chemical activity of the light from the water-cooled iron electrode lamp. This was a condition eminently suitable for a light rich in the violet and ultra-violet frequencies, but not necessarily a light of great quantity. By the oscillatory swing of the corpuscles of the chemical waves of light, especially the precious ultra-violet, the oxygen molecules were made to vibrate more energetically at their own rate, and the influence extended not only to the oxygen carriers of the immediate locality, but to those of the near by circulation, as was evidenced by a beginning improvement in the nasal mucous membrane before a direct application of light was made thereto.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by H. LEWIS JONES, M.D.

The Annual General Meeting was held at 11, Chandos Street, Cavendish Square, W., on Friday, the 27th January, 1905.

President: Dr. DONALD BAYNES.

Dr. JOHN MCINTYRE (Glasgow) read the following address:

Mr. Chairman and Gentlemen,—Permit me in the first instance to express my sincere thanks for, and appreciation of, the honour conferred upon me by being invited to adress the Electrotherapeutic Society of London. I have carefully observed the progress of the Society from the beginning, and in view of its recent formation must congratulate the members upon the success which has already attended the movement, and also those who suggested its formation upon their sound and scientific aims. I only wish it were possible for me to do something of a practical nature to aid the movement, but this I can at least say, when expressing my thanks, that I am deeply interested in the welfare of the Society, and it has my earnest wishes for success.

Not being a member, and therefore somewhat ill-informed as to what kind of subject would be suitable for an address to-night, I thought something of a general nature might be acceptable. Consequently I will try to express some thoughts upon the subject of the present position of electrotherapeutics. In doing so I shall briefly refer to the past, and afterwards to some questions which are bound to come more or less prominently before the profession ere long. The views expressed are only offered for your consideration in the hope that they may to a slight extent stimulate thought in a direction which is much needed by the medical men of to-day.

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Looking back upon the history of electrotherapeutics two thoughts amongst others will impress any careful critic, who may be engaged in the work, viz., the limited number of electrical agents at the disposal of past generations and which could only be demonstrated by means of crude, inaccurate methods and instruments, and secondly, the large number of affections in which it was claimed that electricity in some form or other was found to be useful. Of the first it may be said that the worker of to-day has not only an increased number of so-called forces but accurate and finely constructed scientific instruments, thanks to the great researches going on in our physical laboratories; and of the second that the number of diseases in which the physician of experience, scientific instinct and training finds the agents useful is becoming smaller. The compensations are many, but the most important may be expressed by saying that if we use these agents with less hope in a multitude of diseases we are beginning to understand why they should be employed and what we may expect from their use. Rightly or wrongly from the very earliest experiments in the old physical laboratories many men have looked upon electricity as in some way destined to influence for good the obscure and difficult workings of the subtle agencies, which for want of a better name we call the "vital forces." This feeling still exists and in some quarters would seem to be on the increase. Now if we were to judge by the increase in the number of agents now employed we might find an explanation, especially when we think of the days when all that we possessed was the static machine, the constant current, or what is in medical literature known as the faradic, as compared with an age in which we not only use all these, but varieties of them, and in addition ultra-violet light, X-rays, high frequency currents, not to speak of agents such as are obtained by radiations from radium and others still promised. Whatever be in the future, the net result in the past was something approaching to chaos, in medical literature. As for the layman, thanks to enterprising journalism, false expectations were too often raised in the minds of those afflicted in many instances, not with functional nor minor ailments, but with what might be termed the most terrible of all affections. Clearly then a plain duty lies before the profession and particularly members of it specially engaged in the work of your Society to try to bring into something like order the mass of confused facts which for generations have been collecting. In attempting to do so the members of this and every other electrotherapeutic society can do something, although weighted with a sense of responsibility and conscious of the colossal task.

The difficulty is not lessened by the fact that, especially of late, the agents employed are capable of doing much

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injury. Not that I would lead the members to suppose that at any time it was justifiable to utilize agents on the principle that if they did not do good they would not do harm. Recent events in connection with X-rays at least show that workers incur considerable risk. We also know that patients in a number of cases, fortunately not great in number (and when we think of the great increase of patients submitted to the rays, possibly relatively a smaller number than at first) have also suffered. No one working with an X-ray tube can view with satisfaction the risks taken, and which must continue to be run until we understand better some of the many extraordinary phenomena taking place in the excited Crookes' tube. Difficulties and dangers of using electrotherapeutic agents cannot fail to engross the attention of many members of your Society, and I can conceive of no higher distinction being obtained by any member than successful research into the conditions which have just been indicated.

It is not my intention upon such an occasion as this to raise debatable questions, which can be much better carried on at ordinary society meetings or in the pages of our journals, but it may be permissible to refer to three of these which are destined to occupy considerable prominence in the practice of our profession ere long. The first of these refers to those into whose hands such apparatus should be entrusted. At least this much may here be said, especially in the present condition of knowledge, that even a medical qualification does not always provide for safety, although it legally qualifies men to administer the most recent and dangerous of electrical appliances. This statement is made in the general sense, and at least will not be misunderstood by those who have qualified best for the work by a training in physics and clinical experience in this special department.

The second point I would refer to is the disturbing one of premature reports finding their way into the medical and lay papers, and thereby causing reaction and disappointment, which can only impede progress. The members of the Society can do much by insisting upon accurate diagnosis, mature consideration and scientific classification. Cases of rodent ulcer should not appear in our journals as cancers, at least to such an extent that the lay papers seize upon such statements as cures of these, as if the profession were successfully dealing with the deep seated and serious clinical conditions correctly described as cancer. At best the latter term is a misleading one, and it is a pity the word cancer cannot be expunged from our dictionaries and its existence forgotten. Notwithstanding all that has been done by way of amelioration of the offensive conditions present, the alleviation of pain, and the possible prolongation of life in some cases, yet we are bound to admit, setting aside the results so far obtained in superficial

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forms of epithelioma or those within cavities which may be reached by direct means—and only among the least malignant forms of these—that the results are not such as to justify us claiming success.

Within the last year I had to approach this subject for another reason and from another standpoint. The most recent works upon the subject were consulted, and I had an opportunity of considering over three hundred papers upon the treatment of malignant disease by the means of X-rays, high frequency currents, radium and other agents. That much earnest and ingenious work had been expended in trying to command deep-seated epithelioma and sarcoma was evident, but after carefully reviewing the claims of a few exceptional instances, which have been recorded as successes, stating the facts broadly, it is safe to say that where microscopic investigation had proved the nature of the disease to be genuinely malignant, the results were such as to forbid us claiming a cure for cancer. Many observers have witnessed alleviation of pain, and claim that life may sometimes be more made bearable and prolonged, but cure we cannot claim.

Speaking, therefore, in the interests of all concerned within and without the profession, there can be no doubt that it is best to err by stating what has been gained at the minimum. I sometimes think, however, that those who are not thoroughly conversant with the most recent work are apt to dismiss the question somewhat hastily, and probably not even to give credit for what has really been attained. Can anyone question the value of Finsen's work who reads his last work recording eight hundred cases? I am not one of those blind to the faults of the system. What I do maintain, however, is that while the time for comparison has not arrived, he has proved his case and given us a therapeutic agent of value. In England, at least, if the question of the treatment of lupus were raised in a scientific society, as indeed it has been raised, we should probably find so much conceded even if the majority preferred X-rays or other therapeutic means. The attitude of the scientific mind is, whatever other agents we possess, old or new, here is another placed in the hands of the surgeon. In time such an agent is destined to find its proper place in treatment. Sometimes one could have wished that Finsen's efforts had led him into the investigation of other forces as well as the ultra-violet rays, that we could have had his opinion of comparative values, but that we know was impossible. Nothing is now left for us but to acknowledge our sincere and grateful appreciation of the results of a life's work crowned with success, carried on under most overwhelming difficulties and conditions, and to record the great loss to science and mankind. His example will be a lasting and stimulating one to all workers in electrotherapeutics.

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And what we have said of the success of ultra-violet rays in lupus is equally true of X-rays, in the same affections and a considerable number of other cutaneous affections, including rodent ulcer, which I need not here enumerate. Those who have any doubt in the matter may safely be recommended to the classical work recently published, and for which we are indebted to the genius of Freund. It might be said that in taking such examples we are choosing the strongest, but if so it is justifiable. One could go further and say that your President (than whom no one is more capable of giving an opinion) could say that muscular and nervous lesions have not only been diagnosed with greater care in recent years, but constant, sinusoidal, and faradic currents are taking a safer, if narrower, field in successful electrotherapeutics. I have refrained from speaking of the use of high frequency currents, not because they could not be quoted like other agents as having been successful in the treatment of conditions already referred to, such as superficial neoplasms and other cutaneous affections. That these currents, thanks to the great work of d'Arsonval, may prove of the greatest value in nervous affections no one can doubt, yet here a straightword of caution is needed. With high frequency currents history seems to be repeating itself, and we are again threatened with the utmost confusion owing to indiscriminate use in so many affections.

The third question to which I should like to call the attention of the members relates to the future. I have studiously avoided making any reference to what may be obtained in the future in the way of richer clinical results, but there is one aspect of the question, judged from the scientific standpoint, deserving of a brief notice, and that is the effect all this experimental research must have as an educative influence upon the profession. Let me refer for a moment to what has been discovered in the physical laboratories. Think of the present tremendous activity in scientific circles resulting in many instances in theories almost revolutionary, and which threaten to upset doctrines in science which twenty years ago were looked upon as beyond doubt. The discoveries of Röntgen, followed by those of Becquerel, the Curies, J. J. Thomson, Ramsay, Rutherford and Soddy have put new life into this branch of science. Judged from the purely worldly and material aspect, we have gained nothing practical from all these studies comparable with many of the triumphs of engineering or medical science. The scientific man is quite pleased, however, to know that the world is a little richer in knowledge to-day than it was yesterday although the practical results have not yet been seen. No better example of what I mean could be had than that furnished by recent researches in connection with the

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great question involved in considering the structure of the atom, and the forces acting upon it. As it is in physical science, so it is in medical. I have repeatedly asked the question in previous papers how do these newer forces act? Think of what is taking place when a lesion is yielding to the influence of the X-rays. Some, like Finsen, would say the action is germicidal. This explanation fails when applied to other electrical agents which do the same thing in the same affections. At present we do not know, and we may extend the question further. How do some drugs act? How does strychnine act or prussic acid, or for that matter the simplest drug we have been in the habit of using in medicine? What are the different properties of different bodies, and even of the same body, under different conditions? Great as is the problem for physicists, think of that which lies before the physiologist who has to deal with the highest organic substances known, or atoms in the most complex of combinations. Yet if ever we place therapeutics upon a scientific basis, these questions must be answered. However long we may be forced to deal with empirical methods, these can never satisfy the scientific inquirer. That the physical problems referred to, when solved, must throw much light upon many questions in medicine unanswerable at present no one can doubt, and that therapeutics generally and electro-therapeutics specially will benefit is most probable.

In conclusion, Mr. President and gentlemen, I should like to say that not only the members of this Electrotherapeutic Society, but every member of every other similar society can do, and is called upon to do, something. They can use their influence in two directions: firstly, they can do what lies in their power to strengthen the mathematical and physical education of our coming medical graduates. The training in these departments has been and is still far below the standard necessary for the grave and serious work which confronts the profession. In the second place, the members can at least try to do something directly or indirectly to influence those in authority to rectify the present condition of experimental research in this country, which is nothing short of a standing disgrace to the empire.

It would appear recently that some of those in authority are beginning to recognise that something more must be done if we are to maintain our positions amongst civilised nations in trying to arrest the progress of disease which, after all, is more destructive to man than all the destructive weapons devised for human destruction in war. When appealed to, statesmen have usually been sympathetic, but there has been a striking unanimity of opinion amongst all parties (who usually do not agree) in pointing to the magnificent private endowments which have been made towards education in

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America. There is plenty for the State as well as the private individual to do, and the former cannot neglect this duty much longer with safety. I am not forgetful of the magnificent help in electrotherapeutic work which the benevolent, from the highest to the lowest in this land, have given to many of our hospitals, and for which we are grateful. Many workers in this country, like myself, owe their hospital experience to such help, but when all has been said about what has been and is being done it must be admitted it is largely for clinical work; it does not touch experimental research, the work which only begins when the routine of every-day hospital duty finishes. If we are to stimulate others certain duties are incumbent upon ourselves. All hasty and premature conclusions cannot be too severely condemned. False hopes raised where none are justifiable mean the inevitable reaction which impedes progress. Accurate diagnosis, careful classification and scrupulously exact records of failures and successes alone can justify us in asking the means of carrying on the work. Electrotherapeutics afford an unusually good opportunity for the cultivation of the scientific work of the profession, and while the members of it welcome careful clinical records, still the pages of our journals could often be made richer by more papers dealing with the principles underlying our methods of treatment as founded upon experimental research. That those who founded your Society had such aims and understood the value of scientific research no one can fail to see who has watched its history, and its future depends largely upon recognising and remembering this.

APPARATUS AT THE ANNUAL EXHIBITION OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

The display of apparatus at the Annual Meeting and Exhibition of the British Electrotherapeutic Society in January was of a very interesting character. Those members and their friends who attended found much to interest them, and there were several novelties on view for the first time. High frequency apparatus was shown to a much less extent than was the case a year ago, but appliances for Röntgen ray work were abundant. Those of our readers who were unable to be present may be glad to see the subjoined details of some of the most noteworthy exhibits, and they are therefore arranged for convenience in alphabetical order, according to the names of the exhibiting firms.

A. C. Cossor (54, Farringdon Road, E.C.) showed Villard Valve Tubes of his own manufacture for rectifying the current for use in conjunction with X-ray tubes. These tubes are well made and efficient, and are provided with a means of lowering the

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vacuum when it has become too high after prolonged use. Tubes of this kind will come into general use because they prolong the life of the X-ray tube, and improve the quality of the photographic impressions obtained. Mr. Cossor also showed a small Caldwell interruptor for use with a transformer as a simple and economical means of obtaining currents of low voltage for lamps and cauteries from the direct current mains.

Harry W. Cox, Limited (1A, Rosebery Avenue, W.C.) showed a Tube Shield of indiarubber composition, made to fit on to the X-ray tube. This tube shield has the advantage of softness and flexibility, it is a non-conductor, and is sufficiently opaque to serve as a protection from the rays, without being too heavy to be held in an ordinary tube holder. It is provided with a series of interchageable diaphragms or stops for use when the action of the rays is to be limited to a small area.

The same firm showed a tube holder with double ball standard and socket joint, which presents decided advantages. Also X-ray gauntlets, composed of flaps of flexible opaque material for protecting the hands of the operator; a sterescope, and a portable X-ray coil.

A. E. Dean (82, Hatton Garden, E.C.) showed a Static Machine with sectorless ebonite plates, designed to run safely at a high speed, and provided with simple means for detaching the plates for cleaning purposes. In form this machine resembles the well-known instrument of Messrs. Gaiffe, of Paris, but is said to contain novel features. Also an X-ray shield of thick glass for use in treatment.

Mr. Dean also showed an "Universal" Motor Generator for use with the electric light mains, to provide sinusoidal and three-phase alternating current for treatment, and for heating lamp and cautery instruments, and worked as a motor to operate machines for massage and laboratory treatment.

The Medical Supply Association (228, Gray's Inn Road, W.C.) showed a Portable Coil with Charpentier-Gaiffe Interrupter, designed to work at full spark length from two to three accumulator cells. This type of interrupter is one of the best forms of platinum break, and its use offers great advantages for bedside work. The firm also showed X-ray tubes, water-cooled, and of large size, and a medical coil with special interrupting device.

Leslie Miller (93, Hatton Garden, E.C.) showed in action a milliamperemeter for measuring the current traversing an X-ray tube, and an apparatus of great scientific interest for investigating the true value of the pulsating current of an X-ray coil by comparisons with a battery current of known magnitude. The method is a zero method in which the current of the coil is passed through one of a pair of galvanometer windings and deflects a magnetic needle. This is then brought back to zero by adjusting a direct current through a second corresponding winding, and the reading of a galvanometer in the direct current circuit gives the mean value of the current in the other. He also showed the patent winding machine with which the component parts of the jointless section induction coils are built up, with specimens of the finished coil, and of the individual sections. Step-up transformers for high potentials,

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and the Bartholomew's Hospital lamp for ultra-violet ray therapeutics and a motor transformer for obtaining interrupted and sinusoidal currents from the direct current mains were also on view.

Messrs. Newton & Co. (3, Fleet Street, London) showed the X-ray Diaphragm Compressor of Dr. Thurstan Holland, with some examples of very fine photographic work done by the aid of this appliance. This instrument consists of a heavy metal tube with interchangeable diaphragms. The tubes are of various shapes to suit the different parts of the body. They also exhibited Morton & Wright's combined Rectifier and Interrupter for use on alternating circuits for operating X-ray coils and for accumulator charging. They also showed three X-ray tubes excited simultaneously in parallel from one of their coils, and a Wodal jet break, which seemed to run very steadily and silently.

Sanitas Electrical Co. (33 and 7A., Soho Square) showed an elaborate X-ray couch and operating table, the special features of which consist in (1) a detachable top which can be used as an ordinary stretcher to save unnecessary handlings of a patient (2) a footboard at the side of the couch for switching off the X-rays and switching on an electric lamp by a simple movement of the foot. This device is useful in the case of operations conducted in the X-ray room for the removal of foreign bodies. In addition the "Shenton-Sanitas" couch has all the ordinary fittings and movements for X-ray work with the tube beneath the patient. The same firm also showed switch-boards for use on the supply mains, a water cooled focus tube a "Wodal" mercury jet interrupter, portable coils, and for appliances light treatment and mechanical massage.

Mr. Schall (75, New Cavendish Street, W.), exhibited an assortment of switchboards, spark-coils, &c. Also an improved form of wehnelt interruptor designed to give a very wide range of adjustment both as to frequency of interruptions, and as to the magnitude of the current in the primary circuit. The interruptor was in a vessel of large size so as to stand long use, and was realised in a sound-proof box so that its action was nearly noiseless. He also showed valve tubes, and milliamperemeters for use in X-ray work and suitably mounted for attachment to the ordinary X-ray tube stands. Also a cylinder compressor with diaphragms for X-ray photography and an universal motor generator for sinusordal currents, lamps and cauterus with an attachment permitting it to be used for mechanical vibration and massage.

W. Watson & Sons (313, High Holborn, W.C.) showed Protective X-ray Gloves of a useful type, made of opaque flexible material, and very convenient for practical use; also an X-ray tube with a special arrangement of electrodes for improving the quality of the X-rays when operated with a coil by diverting the inverse impulses from the field of action. It is claimed that, with one of tubes, a high potential transformer can be employed direct in X-ray work without the need for any valve tube or other "rectifying" device. The anode, or second terminal, is at a distance from the antikathode, and is so placed in the tube that when the current is in the inverse direction its bombardment is directed into a depression ät the back of the antikathode where it is inocuous.

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MEDICAL

Electrology and Radiology.

No. 3. MARCH, 1905. Vol. VI.

EDITORIAL.

The good results that have been obtained in the treatment of Ringworm by radiotherapy are strikingly exemplified by the conclusions drawn by Saboraud in an article on this subject in the current number of the *Annales d'Electrobiologie et de Radiologie*. During 1903, in the Saint Louis Hospital, there were 104 cases cured, and up to that time the average duration of each child in the hospital was between 18 months and two years. In 1904 there were 586 cases cured, including 212 treated as out-patients, with an average duration of time under treatment of three months. The main advantages gained by this method of treatment are summed up in the increase of the number of cases cured without being taken into hospital, the consequent liberation of the hospitals for other purposes, the diminution of the time required for treatment, and the suppression of the provincial hospital schools, no longer necessary. A point of great importance is the enormous saving of expense previously incurred by the State in attempting to eradicate this disease. Saboraud's method has been previously reported in our pages, but the present paper describes his technique more fully, and we propose to insert it in full next month. Much attention has been given to this work during the past year in this country, and we hope to be able to collect and compare the methods employed and the results obtained. Saboraud uses a static machine to excite his tube and employs Benoist's radiochromometer to gauge the quality, and the barium platino-cyanide radiochromometer, devised by himself and Noiré, for the quantity of the rays. It will be remarked that he finds that it is more dangerous to work with rays marking about 10° on the Benoist than on those marking 4°, and that the time necessary

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for depilation in the former case is only half that required in the latter. This is not the universal experience in this country, and it will be of great interest to collect details from different observers on this point. It must be remembered that the action of the X-rays, while inhibiting the function of the papilla, is not fatal to the ringworm parasite, and great care must be taken to avoid reinfection of the scalp. Also the dangers of using too small a dose and having to repeat it, or overlapping in treating two contiguous areas must be borne in mind, as the possibility of causing a burn or permanent alopecia is by no means remote.

Accurate measurement and dosage and careful attention during the exposures should eliminate all risk, and in careful hands we have in this method the most certain and perfect treatment of what has hitherto been a most stubborn and intractable condition.

The following apparatus was inadvertently excluded from the report of our recent exhibition which was published in last month's issue of this Journal :—

Messrs. Smith & Wade, 20, Baker Street, London, W., exhibited a new type of vibrator, operated by means of compressed air. This consists of a "T"-shaped handle, the inlet being at the foot and the oscillating piston within the cross bar. Its chief points are great intensity of vibration combined with an entire absence of friction ; no wear or tear with consequent absence of any fear of break-down ; its adaptability for use at a patient's bedside or in houses unequipped with an electric supply. It can be operated either by (1) a hand pump and air receiver, (2) an electrical air compressor, (3) small hydraulic air compressor, or (4) an ordinary CO_2 cylinder, which, when charged to 150 atmospheres, will run the vibrator for several consecutive hours.

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THE RÖNTGEN RAY AND STERILITY.

By MARGARET A. CLEAVES, M.D.

The writer has always regarded the energy of the Röntgen ray as an agent for harm as well as for good. No energy, no matter what its source, of so irregular and disorderly character as is the sudden and infrequent impulse of the X-ray, can be expended upon or within the living tissue without the possibility of disastrous results. The indiscriminate use of this agent therapeutically in conditions where the indications can be equally well met with other manifestations of radiant energy or by an expenditure of electrical energy is reprehensible. In frankly malignant pathologies, it is the agent *par excellence*, and for diagnostic purposes no exception can be taken to its skilful use. But the common practice of using it in various benign conditions where the indications can be equally well met with the rhythmetic energy of the spectrum, visible and invisible, or by a judicious selection of electrical force, is to be condemned.

The limitations of this powerful physical energy are as yet unknown to us, and it may exert an influence beyond anything that has been conceived of. The untoward action upon the dermis, as studied by Darier, Unna, Jutassy, Minich and others, and upon the cellular equilibrium of the blood, as studied experimentally by M. H. Henecke, and chemically by Mante, as well as the excessive increase of pigment in the spleen of small animals, with a disappearance of the follicles and a general disappearance of the splenic pulp, has already been recorded editorially in the pages of *Medical Electrology and Radiology*. The untoward action upon the hæmoglobin predicted by Sodye from the physical side only, has thus been proven, and is also evidenced by the ghastly chlorotic pallor of the habitual X-ray worker. The untoward action upon the dermis is the best known of its injurious effects. The development of cancer upon the site of X-ray lesions is not a rarity, and the loss of hands, arms, and life in consequence. Without a careful statistical examination of the literature of these cases, the impression remains that they occur in those radiographers who are in the habit of using photographic chemicals. Here, then, is a point to be elucidated. What relation do these photo-chemicals bear to the tissues, and the X-ray in influencing the development of precancerous or cancerous conditions. Do they act as sensitizers of living tissue, thereby rendering the latter more susceptible to the action of the X-ray energy (*Medical Electrology and Radiology*, July, 1904). Now comes an additional clinical observation, substantiated by experimental research, which, more than

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anything previously observed, will tend to (1) a restriction in the use of the X-ray; (2) a more complete protection from its action on the part of the operator; and (3) the probable addition of X-ray equipments to the armamentarium of the irregular and unscrupulous practitioner.

At the January meeting of the section on Genito-Urinary Diseases of the New York Academy of Medicine, a series of observations with regard to the sexical condition of physicians and patients who have been exposed to the X-ray was made by F. Tilden Brown, who reported the result in the following communication to the *Medical News*: "He had to announce that men by their mere presence in an X-ray atmosphere, incidental to radiography or the therapeutic uses of the rays, after a period of time—as yet undetermined—will be rendered sterile. In the last few days ten individuals who have devoted more or less time to the work during the past three years, none of whom had any venereal disease, or traumatism involving the genital tract, have been found to be the subjects of absolute azoospermia, none of the number are conscious, however, of any change or deterioration in regard to their potency." Had there been any indication of a lack of sexual potency, reports would have been made along this line before. These observations were begun almost by accident. In one reported case treated by X-rays for pruritus ani, active spermatazoa were known to have existed before exposure to the X-ray energy, but they disappeared after treatment and for several months no signs of spermatazoa could be found. After some three months there was a gradual return to the normal, and active spermatazoa could again be discovered. It is a year since Akers Schonberg first drew attention to the fact that in male rabbits and guinea pigs in which the abdomen was exposed to the action of the X-ray an azoospermia was gradually developed. Subsequently Frieben found that this was due to the disappearance of the epithelium in the seminal tubules, which resulted in an atrophy of the testis. The observations of F. Tilden Brown are evidently the first reported upon the human subject and are confirmatory of the animal experiments of Akers Schonberg and Frieben. More recently, *Berliner Klinische Wochenschrift*, Jan. 16th, 1905, Halberstaedter who worked in Professor Niesser's clinic under the latter's direction presents a communication embodying the following facts: He studied the effects of the Röntgen rays on the ovaries of rabbits and found that by exposing one side of the abdomen while the other was suitably protected, that marked macroscopic and microscopic alterations took place as determined by subsequent autopsies. That any possibility of error should be avoided, the ovaries in another series of animals were first inspected by performing an exploratory laparotomy and then exposing them to the rays

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after the abdominal wound had healed. In this way any inherent difference between the two organs could be noted. Thus it was proved that the marked differences between the two sides could be ascribed to nothing else than the energy of the rays. The complete disappearance of the Graafian follicles in about fifteen days was the most evident histological change. It has not yet been determined whether this loss is permanent, and whether or not regeneration can take place. It was observed that the ovaries seemed more sensitive to the effects of the rays than the outer skin of the abdomen, and comparison with central experiments with male rabbits, developed degenerative changes in less time and with fewer exposures. There is a certain clinical evidence going to show that, from repeated exposures to X-ray energy, fibroid tumours of the uterus have diminished in size, and it is a recognised means of treatment in the hands of some operators for this purpose. There has been disappearance of the pain and pressure symptoms, and control of the hæmorrhage. The question arises as to the possible relation between the action on the ovaries, as shown by Halberstaedter's experiments, and the diminution of the fibroid growth. If the action of an exposure to X-ray energy is upon the ovaries, its use becomes at once rational. When some of the biological effects that have been known to occur as the result of the exposure of lower organisms of various kinds to the action of these radiations are recalled, the astounding fact seems not so much that X-ray energy produces these disastrous results upon the testis and Graafian follicles, but that attention was not turned in this direction at an earlier date. Seeds exposed even for a few hours to the action of the X-rays lose their germinating power, and those that do germinate grow very slowly—longer exposure kills the seeds entirely. Insects which usually undergo complete metamorphosis in their secondary life cycle have been the subject of experiments with the X-ray and radium radiations. The meal worm which under ordinary circumstances becomes a beetle after a certain number of days does not after exposure to the X-rays undergo normal metamorphosis. It continues to live and eat and thrive without any tendency to go through the rest of its cycle of existence until death, intervenes long after their brothers or sisters have passed through the beetle stage, laid eggs which have in turn become meal worms and then beetles, these "Methuselah" meal worms as they have been called will still be in the worm stage. The report of F. Tilden Brown is eminently conservative, and when taken in connection with the experimental evidence reported, can not in any sense be regarded as sensational. The necessity for protection on the part of X-ray workers at once becomes apparent. It is not known clinically how far these observa-

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tions on animals will apply to human beings, nor is it known how permanent the effects are. Meanwhile the evidence of a destructive action upon the various constituents of living tissue are sufficient to invite as conservative use of the X-ray as of the surgeon's knife.

THE TREATMENT OF LEUCÆMIA AND LYMPHADENOMA BY X-RAYS.

By R. HIGHAM COOPER, L.S.A.,

Hon. Radiographer to the Tottenham Hospital.

This method consists in the X-raying of the spleen and the ends of the long bones of the extremities. The credit of the first reported case has been wrongly given to Senn of Chicago, who in August, 1903, published the results of two cases of lymphadenoma in the *Medical Record*. The effect-obtained were an enormous reduction in the number of leucos cytes and in the size of the glands affected, with some increase in the number of red corpuscles. The first record I can find is that of Sterne (*Indiana Med. Journ.*, 1902, Vol. 21, p. 56), the results being similar to those of Senn. Pusey in April, 1903, reported two cases, in one of which there was marked improvement, while in the other practically no effect was obtained. Within the last year a number of cases have been reported in various journals, from which I have collected the following :—

Rohde of Copenhagen (Anal. in *Ed. Med. Journ.*, Feb., 1905). The patient showed a severe form of the disease, the spleen was very much enlarged, reaching to within 1 inch of the iliac crest. The blood contained two and a half million red corpuscles and 236,000 white, 47 per cent. being myelocytes, hæmoglobin 40 per cent. X-ray treatment commenced 27th June, exposing spleen daily for 10 minutes ; from the 7th July the long bones were also exposed for from two to three minutes ; by the 5th July the spleen had already begun to shrink, but there was no change in the composition of the blood ; at the end of another week the blood had improved : Hb. 59, reds 3,600,000, whites 208,000, myelocytes 25 per cent. After another seven days, the whites were only 200,000, myelocytes 10 per cent., while the spleen had shrunk a further inch and a-half. At the end of a month's treatment the skin began to show signs of irritation, and treatment was stopped on the 3rd August, the condition being Hb. 60, reds 4,000,000,

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whites 7,200; at the end of the next month, Hb. 70, whites 4,000, and the spleen had reached almost normal proportions.

Hynek (*Arch. Bohem. de Med. clin.*, tome IV, fasc. 1) records two cases; the first was successful: At the commencement of the ray treatment the whites numbered 234,000, myelocytes 37 per cent., at the end of the first month 143,000, second month 68,000, and at the end of third month 23,000; after five months' treatment the number of whites was 7,582, myelocytes 0·4 per cent., meanwhile the reds increased from 4½ to 5 millions, hæmoglobin from 82 to 102. The spleen was greatly reduced in size. The patient had a relapse which, however, only affected the blood as the spleen did not increase in size; a few exposures checked the relapse. In the second case, despite the persistent use of the rays, the blood condition was only slightly improved.

Joachim and Kurpjweit (*Deut. Med. Woch.*, Dec. 1st, 1904, Anal. in *Brit. Med. Journ.*, March 4th, 1905) report two cases. In the first the spleen was enormous, reaching from the symphysis upwards and crossing the middle line towards the right half of the abdomen; reds 2½ millions, whites 693,000, hæmoglobin 40 per cent., at the end of four weeks the number of whites had been reduced to 315,000, improvement having been noticed from the first week, brown spots then appeared on the area exposed, and the treatment was interrupted. After four days the rays were applied to the ends of the long bones. In spite of the improvement in the blood, fever set in, and the treatment was once again stopped. Two months after the commencement of the treatment, a third application was begun, and this time the region of the spleen was again chosen. Six weeks later the blood count showed 3,400,000 reds and 6,300 whites, and a considerable improvement in the diminution of the number of myelocytes. Uric acid secretion, which had been very high, was normal and the spleen decreased in size enormously. Later the white blood cells again increased in number but at present they are again decreasing. The general condition of the patient had become excellent. The second case was that of a man of fifty who was suffering from typical chronic lymphæmia; in this case the lymphatic glands in the axillæ, under the jaw and the inguinal region were enlarged, as also were the liver and the spleen; reds 3,200,000, whites 385,000, and Hb. 55. 98 to 99 per cent. of the leucocytes were lymphocytes. Röntgen rays were applied and KI given internally, the blood improved greatly as far as the white cells were concerned, but the type remained leucæmic. The weight, too, did not improve, and yet the lymphatic glands almost disappeared, and the spleen became much smaller. The treatment had to be discontinued for private reasons. In about a month, when he again turned up, the improvement

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showed itself to be maintained, his weight was better, the blood showed improvement as far as the lymphæmia was concerned, only red corpuscles were fewer. The lymphatic glands in the spleen were about the same as when he left the hospital before. Brief notes are also given of a third case of anæmia splenica in which the X-rays did not improve the condition.

Lewis Jones states (*Med. Elect.*, p. 488): "In a case of lymphadenoma, under my own care, no good result followed the repeated application of X-rays."

Wendel (*Berlin Klin. Woch.*, Jan. 23rd, 1905) reports a case in which very marked improvement followed the use of the rays so that the patient who had been in a critical condition was enabled to return to work and the leucocytes dropped from 56,000 to 16,000. Omission of the treatment for any length of time gave rise to relapses which, however, promptly succumbed to further radiotherapy.

At a meeting of the Chicago Med. Soc. held January 25th, 1905, J. A. Capps and J. F. Smith, in summing up a joint paper on this subject, stated that splenomyelogenous cases of leucæmia were greatly benefited by X-ray treatment, although they responded more slowly than cases of chronic lymphatic leucæmia. There was so much benefit that the patients themselves felt they were cured.

Fried (*Münch. Med. Woch.*, Oct. 4th, 1904) publishes two cases in which the number of white corpuscles was rapidly brought almost to the normal, while the number of red corpuscles and the percentage of hæmoglobin were increased with reduction of the size of the enlarged spleen.

Bryant and Crane (*Med. Record*, April 9th, 1904) publish two cases. The first, a woman of 33, was suffering from amenorrhœa, wasting, anæmia and enlargement of the spleen. Blood count showed 176,000 whites. Treated with iron, arsenic and X-rays. In a fortnight the whites numbered 55,700 and there was increase in the number of reds. In a month whites 4,500, absolutely normal, and no nucleated red corpuscles. "The patient recovered completely with a normal spleen." In the second case the whites were reduced in number from 200,000 to 6,400, and the spleen became "of normal proportions."

Guilloz et Spillmann (*Ann. d'Elect. et de Radiol.*, No. 2, 1904) give figures of twelve examinations of the blood in a case in which there was one relapse. The final result showed much diminution in the number of white corpuscles, and also a slight diminution in the number of reds. The general condition was greatly improved, epistaxis, which had been marked, ceased almost immediately, and the spleen was much diminished in size.

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Steinwand (*Archiv. f. klin. Chir.*, band 72, heft 4). This case showed numerous enlargements of the glands of the neck and axilla, the general condition, already very bad, became still worse when arsenic was given. X-rays were then tried, and ten applications produced violent inflammation. The treatment was stopped, and nine months afterwards the cure was complete. The spleen was originally enormously enlarged. At the commencement of treatment the condition of the blood was: reds 2,600,000, whites 800,000, hæmoglobin 65 per cent.; finally reds 4,690,000, whites 7,894, Hb. 95 per cent.

Senor (*Ann. d'Elect. et de Radiol.*, No. 3, 1904). This case was particularly noticeable on account of the enormous size of the spleen, which reached the pubes and three inches to the right of the umbilicus, and was very painful and tender. The size of the spleen and the number of leucocytes were lessened, and the general condition much improved.

Aubertin et Beaujard (*Soc. de Biol.*, June 11th, 1904) found that irradiation of the spleen produced a diminution in the number of leucocytes, but that this diminution was not regularly progressive. Each exposure was followed by a short yet considerable increase in the number of white corpuscles, followed by a slow fall. At first this increase was almost immediate; later, when the patient became accustomed to the treatment, it did not occur until the following day, and even later; after some time the increase became scarcely perceptible, and a definite diminution was the only noticeable phenomenon. This leucocytosis was not only concerned with the myelocytes, but with the multinucleated cells. These blood changes appeared some time before there was any noticeable diminution in the size of the spleen.

Maixner of Prague exposed two leucæmic patients to X-rays: in one of them the benefit was nil, whilst in the other an apparent cure was obtained after two relapses. Each of these relapses, however, readily yielded to treatment, and was only manifested by alterations in the blood, the general condition of the patients continuing to remain satisfactory, and the size of the spleen, which had been greatly diminished by the first treatment, remaining stationary.

In a case of my own, a woman aged 29, there was considerable reduction in the size of the spleen after three weeks' treatment. I exposed the ends of the long bones and the region occupied by the splenic tumour for ten minutes three times a week, using a regulator tube with 4-inch spark gap, and 20 volts 5 amps. on the primary. There was a slight inflammatory reaction, and I discontinued treatment. On examination of the blood, I found reduction of leucocytes from 62,000 to 8,500. Reds about the same in number. I

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then lost sight of the patient, though I heard some few weeks after that she was "quite well." No doubt she had a relapse and went elsewhere for treatment.

I am now commencing this treatment in two cases by the method of a single maximal dose (using Sabouraud's radiochromometer), with the idea of repeating the dose in a month's time.

From these results we must conclude that X-rays exert a greatly beneficial influence on leucæmic conditions. The state of the blood in many cases becomes normal, the general health is much improved, and the spleen and lymphatic glands (if affected) are markedly reduced in size. The spleen, however, appears never to quite return to its original size, although Bryant and Crane report two cases in which this apparently did occur. The question of a cure has scarcely had time to be settled; it is certain that relapses occur, though these usually readily yield to further treatment, and appear only to affect the blood. At the same time, in some few cases, the rays seem to have been quite useless. The results obtained must also be somewhat discounted, as in most cases other treatment (such as administration of arsenic) was combined with the irradiation; but we must also remember that this treatment had usually been tried without effect for some considerable period beforehand.

The cause of these effects of the rays is not clearly understood. Fried, while treating malignant growths, noticed a large increase of erythrocytes. Coley, Pusey, and many others deny this. I have examined the blood in several cases of carcinoma under X-ray treatment and have only found a slight progressive diminution in the number of red corpuscles, a condition one would naturally expect in this disease. Lépine and Boulud (*Soc. Méd. de Lyon*, Nov. 30th, 1903) conclude from many experiments upon animals that X-rays have a powerful destructive effect upon the glycogen in the liver. Guilleminot (*Electricité Méd.*, p. 311) states that X-rays favour glycolysis in defibrinated blood. In a case of immense carcinoma of the liver under my care there was rapid reduction in the size of the tumour, accompanied by glycosuria and toxic symptoms. I discontinued X-ray treatment, and a fortnight later both glycosuria and toxic symptoms had vanished. Many writers have recorded toxic effects when treating malignant growths, and the general opinion seems to be that these are due to the absorption of degenerated tissue. It seems possible, however, that the rays may directly produce toxins having an inhibitory effect on the medulla of the bones.

Bordier finds that X-rays falling on an osmotic membrane retard osmosis.

Baermann and Linser (*Münch. Med. Woch.*, June 7th, 1904)

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think that the primary therapeutic effect of X-rays is on the walls of the blood vessels, especially the membrana interna, and that all other effects are secondary to this.

I have not found the spectroscopic properties of the blood to be modified by X-rays.

Heineke (*Münch. Med. Woch.*, Nov. 18th, 1903) found from experiments on animals that a short exposure to X-rays rapidly produced degeneration in the lymphatic follicles of the spleen and also in the lymphatic glands all over the body without disturbing the general health.

The application of the rays then seems to produce a destruction of lymphatic tissues and also a toxæmia. It does not seem clearly established whether or no these conditions are the result one of the other. In fact, much work still remains to be done on the pathological changes involved, and the treatment must still be regarded as largely empirical.

Diagnosis of Aneurism of the Aorta by X-rays. G. Bedart.—The classic symptoms of aneurism, inequality of the radial pulses and pupils, suprasternal pulsation, thrill, angina and dysphagia, may be present without aneurism. Every shadow from a pulsating enlargement above the aorta does indicate an aneurism. These shadows may be due to mediastinal tumours and elongation of the aorta, due to atheroma. A case is described of a man aged 49 with dysphagia, with an enlargement to the left of the aortic shadow. After five months the temperature rose and dysphagia increased, when one night fœtid pus was vomited, and the shadow of the aorta only showed want of definition. The patient died soon after ; there was no post-mortem.

It is difficult to diagnose aneurism of the aorta by X-rays alone, for atheroma may cause elongation and displacement of the aortic shadow.

But X-rays may clench a diagnosis in the early stage when other signs are vague, and is of special value to fix the seat and size of the enlargement as well as its progress.—*Echo Médical du Nord*, 22nd Jan., 1905.

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DIGEST OF CURRENT AMERICAN LITERATURE.

LIGHT ENERGY.

LOCOMOTOR ATAXIA SUCCESSFULLY TREATED WITH ULTRA-VIOLET RAYS.—Under the above heading J. Munro Liebermann presented a paper to the American Electrotherapeutic Association at its Fourteenth Annual Meeting at St. Louis, September, 1904. After a brief review of the underlying pathology of tabes dorsalis, and the necessity for the early recognition of the disease, he states that the therapeutic indication is for an agent that will stimulate the nutritive activity of the nerve cells undergoing atrophic changes, and at the same time diminish the nutritive activity of the increased connective tissue associated therewith.

Electricity in its various manifestations has long been looked upon as the only natural force that traverses the tissues to their uttermost depths, and excites their irritability, whether protoplasmic as in the individual cell, or organic as in the nerve cell—the electric treatment should therefore always be central as well as peripheral. Liebermann uses for the central application ultra-violet energy, following its use by an administration of static electricity, either the Morton wave currents or the application of the wooden brush for ten or fifteen minutes daily. As a source of ultra-violet light he uses the condenser spark lamp original for the coil with Dorl of Munich, and the static machine with Leduc of France. In Liebermann's practice, this condenser spark lamp. is excited by a static machine, the largest Leyden jars being used. Before using the light, the part to be exposed is first rendered bloodless by the use of andrenalin cataphorically. A solution of 1 : 1,000 adrenalin chloride is used, but two localities are treated at each *séance*, and the area should be varied so that every day a different region of the cord is treated—the cervical lumbar and sacral regions are treated alternately or in rotation. The following comprises his routine treatment :—

(1) A warm bath at night before going to bed, with light massage.

(2) Ultra-violet rays in sittings of ten to thirty minutes, three times a week.

(3) Static electricity by means of the Morton wave current or wooden brush daily, fifteen to twenty minutes.

36 cases—males 34, females 2—in all had been treated ; their ages ranged from 24 to 63 years. Four have been restored to good health, and are now able to resume their usual vocations. Twelve have been greatly benefited, the power of co-ordination has been restored, pain abolished, and the ability to use the upper and lower limbs without any assistance established. All are able to rise, dress and undress themselves without any help, and are sometimes able to perform such delicate operations as fixing the

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necktie or tying their shoes in a stooping position. In 18 cases the disease is apparently arrested, with hope of further improvement, and final restoration of different functions. Two died during the treatment, one from lobar pneumonia, the other of erysipelas capitis. For years these cases had received different forms of treatment, as the Matchkovsky modified new Mitchell suspension treatment, entire and partial body hot-air treatment, hydrialic treatment, as well as the Frenkel method. As a theory of action, Liebermann suggests that the powerful stimulating effect of ultra-violet light induces more activity in the natural healthy cell, and diminishes the nutrition of connective tissue, setting up a more active local metabolism. Another hypothesis similar to that advanced by Professor Sajous as to the rationale of the curative action of the Röntgen ray is equally applicable to the ultra-violet ray, namely, that it induces a local accumulation of heat energy, and a congestive process through which neutrophile leucocytes are caused to immigrate into the vicinity of the degenerated cellular elements into normal and healthy cells. One characteristic and almost invariable effect of the treatment with ultra-violet rays in combination with the electric stimulation of the peripheral nerves and their end organs is the improved general nutrition of the patient. They all improve in general health, and increase rapidly in weight. The 36 cases presented the following complications: secondary and tertiary syphilis, 8; pulmonary trouble, 3; marked anæmia, 29; cardiac lesions, 7; diabetes, 2; and excess of phosphates and uric acid was shown in 34 cases, amounting from 8 to 14½ grains to the ounce. The necessity of eternal vigilance, thorough methods, scientific perfection of technique, constant exercise of professional discretion acquired by painstaking clinical observation are insisted upon.—*The New York Med. Journ.*, Feb. 18th, 1905.

Remark.—In tabes dorsalis it may not only be possible but is very probable, by reason of the interference with the circulation (pressure from increased connective tissue obliterating or interfering with the normal calibre of the blood vessels), that the normal oxygen saturation of the nerve structures is not maintained; the indication therefore in therapeutics is for a measure which will increase the oxygenating power of the blood. At the same time the production of a more or less lasting hyperæmia of the degenerating cord is indicated just so far as the oxygenating power of the blood stream can be maintained, and a hyperæmia of the intimate circulation of the cord secured just so far it is possible to combat the progress of these degenerative changes. By the action of chemical light energy there is established a dilatation of the cutaneous vessels which determines a more active blood supply to the part. This in turn must be assumed to favourably influence nutrition, not only enabling the skin but deeper tissues for that matter to perform their function. Ultra-violet rays have a great affinity for oxygen and the blood absorbs these rays better than any other tissue. We have advanced the hypothesis that in the rhythmic flood of the short and light frequency vibrations of both the visible and invisible chemical region, but especially of the

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invisible ultra-violet, that there is a rate of vibration or oscillating movement which is in harmony or synchronism with the rate of vibration or swing of the molecules of oxygen. The action of chemically active light, whether blue, violet or ultra-violet is upon the blood, increasing its oxygenating power. An increase of red blood corpuscles means increased leucocytosis as well as increased absorptive activity. In Liebermann's cases three agents were used, all tending to an increase of nutritive activity, viz. :— the continuous current anodal to drive the adrenalin into the tissues, but not idle meanwhile, ultra-violet energy and static electricity. We do not question for one moment the value of light in tabes, on the contrary, we believe it to be an agent of great value, but to determine that value it should be used alone. In clinical work just as good results as those reported have been observed from the use of electricity, the continuous current as well as static electricity—characterized by lessened pain, better co-ordination, recovered vesical and rectal control, improved nutrition and increased weight. In the hands of some neurologist who relies upon medication in connection with other physical methods, more cases should be treated in which the exact stage of the pathological change should be recorded and careful observations made in order to determine the exact value of light. Of the physical agents we would give it preference, but the more blue-violet energy of a powerful arc wonld be chosen rather than a source of ultra-violet energy alone. When its rôle is fully established, then an expenditure of electrical or other energy will unquestionably enhance the benefit.

THE AMERICAN EDITOR.

The Treatment of Nævus by X-rays.—Levack describes three cases of nævus flammeus in which X-rays treatment was successful after a moderate current had been used for some time without result, he utilised a current of 100 volts seven amps. working with a ten-inch coil and electrolytic break, daily sittings were given of three minutes' duration until a violent reaction was produced. The raw surface healed in about three months, and the part was free from nævus, the remaining scar being very slight.—*Scot. Med. and Surg. Journ.*, July, 1904.

[Objection has been taken to this form of treatment on account of the "burning" produced. We have ourselves treated several cases, and find it impossible to obtain any result without violent inflammatory reaction ; the results, however, seem to be sufficiently good to justify the somewhat drastic method. The subsequent scarring is not great, and certainly nothing like so noticeable as the previous disfigurement. Still, equally good results seem to be obtained by phototherapy, which offers less risk.] R.H.C.

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NOTES AND ABSTRACTS.

Cancers and Radiotherapy. G. Legros.—In order to compare results it is necessary to measure the quantity of the rays emitted from a given distance in a given time, and the quality of the rays which depends on the hardness of the tubes, and lastly the duration of the exposures with the intervals between them. The type of cancer most amenable to treatment is the basocellulaire, flat epithelioma, without keratosis, with cells resembling those of the rete, most common in old persons on the upper two-thirds of the face, beginning as a crack or sago grain nodule, of slow growth, not involving the glands, though returning locally even after free excision. Under X-rays they disappear like a syphilitic gumma under mercury or iodide. In these tumours primary surgical treatment is desirable, for small ones curetting or galvano-cautery.

Spinocellular epitheliomas where keratisation and cells resembling the basal layer of the rete are seen, with birds-nest cells. Darier considers that of this type there is not one well authenticated case of cure. But the type has two varieties ; the papillary variety affecting the face, scalp, neck, back and dorsal surface of the extremities ; in this treatment has been successful. The other variety, without prospect of success (spinocellular carcinoma), attacks the mucous surfaces rapidly involving the glands.

Breast cancers are benefited, (1) when local or general causes prevent operation, (2) as preliminary to operation when there is associated œdema, (3) complementary to surgical treatment to prevent recurrence, to remove early recurrent growths and relieve the pain in older ones.

Records are accumulating of the cures of sarcomas, but are vitiated by the uncertainty of return after operation. Benefit results from injecting bichlorate of quinine into the tumour half-an-hour before exposure to the rays.

X-rays have special action on new growths, the cell nuclei swell, do not stain well, the outlines of the cells become indistinct and fuse, the protoplasm becomes irregular, is invaded by leucocytes and absorbed, leaving a net work of dense connective tissue containing vessels with thickened walls from endo and peri arteritis due to the rays.—*Gazette des Hopitaux*, 28th January, 1905.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by R. HIGHAM COOPER.

The Third Annual General Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on Friday, January 27th, 1905, at 8.30 p.m. The retiring President, Dr. H. LEWIS JONES, in the Chair.

Present:—33 members and eight visitors.

The minutes of the previous meeting were read and confirmed.

The following gentlemen were unanimously elected members of the Society:—Faustin Boclet, Esq., M.R.C.S., Wantage House, Strawberry Hill, S.W.; Alfred Lenmare, Esq., M.R.C.S., etc., Park Court, Clapham Park Road, S.W.

The annual election of officers for the ensuing year then took place. Drs. J. Donald Pollock and A. D. Reid were appointed scrutineers.

The vote in favour of the officers suggested by the Council was, with two exceptions, unanimous. President: Dr. Donald Baynes. Vice-Presidents: Dr. Dawson Turner (Edinburgh); Mr. Chisholm Williams. Council: Dr. J. Allan (Chislehurst); Dr. David Arthur; Dr. G. B. Batten; Dr. James Berry (Ramsgate); Dr. J. A. Codd (Wolverhampton); Dr. R. H. Cooper; Dr. Hall-Edwards (Birmingham); Dr. G. H. Graham; Dr. W. S. Haughton (Dublin); Dr. George Herschell; Dr. J. D. Pollock; Dr. A. D. Reid; Dr. Samuel Sloan (Glasgow); Dr. Septimus Sunderland; Dr. C. A. Wright. Treasurer: Dr. H. McClure. Assistant Treasurer: Dr. Lewis Jones. Hon. Secretaries: Dr. R. Morton; Dr. H. E. Gamlen (West Hartlepool).

The annual address by Dr. J. McIntyre, of Glasgow, was read by Dr. Lewis Jones, Dr. McIntyre being unavoidably absent through illness. A hearty vote of thanks was accorded to Dr. McIntyre for his address, and to the officers of the Society for their services during the past year.

The meeting then adjourned. (Dr. McIntyre's address was published in our last issue.)

The 27th Ordinary Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on Friday, the 24th day of February, 1905.

The President, Dr. DONALD BAYNES, in the Chair.

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There were present 16 members and two visitors.

The minutes of the previous meeting were read and confirmed.

The following were then duly elected as honorary member:—John McIntyre, M.B., C.M., 179, Bath Street, Glasgow. As ordinary members: Señor Jaime R. Costa, Buenos Ayres, A.R.; Alexander Gregor, M.B., C.M.Aber., Penryn, Cornwall; Thomas W. Stainforth Paterson, M.A., M.B., B.C., 42, Holland Park, W.; John Mason Flavelle, M.R.C.S., L.R.C.P., Junior Athenæum Club.

It was proposed by Dr. Horace Manders, seconded by Dr. J. Donald Pollock and carried, that Dr. Lewis Jones take the Chair while the President read his paper.

The PRESIDENT then read his paper on "The Treatment of Constipation and Hæmorrhoids by Physical Methods."

Mr. Chairman and Gentlemen,—Constipation, as its derivation (*con*, together, and *stipo*, I cram) indicates, may be briefly described as a cramming together of the contents of the intestines, owing to a sluggish passage of fæces through the intestinal tract, inducing infrequent, incomplete alvine evacuation, and even absolute retention.

Constipation is probably one of the most common of ailments (especially among women) we are called upon to treat, and one that more often than not is entirely the fault of the sufferer.

In this paper I only propose to deal with what is known as habitual constipation, which has been caused by errors of diet, neglect or postponement of the calls of nature, sedentary occupations, prolonged over exertion (physical and mental), collections of scybala, in some part of the intestinal tract, owing to excessive dryness, deficient or altered secretions, weak abdominal muscles, obesity, feeble contraction of the intestinal muscular fibre, the habitual use of aperients, enemata, etc., or to constipation dependent on certain affections amenable to and curable by physical therapeutics, such as anæmia, neurasthenia (which means loss of nerve control), an excess of uric acid in the system, which neutralises the alkalinity of the succus entericus; and other similar disorders.

Constipation caused by deep-seated nervous diseases, cerebral or spinal, or to diseases requiring surgical interference, pressure on the rectum from uterine tumours, and displacements; enlarged prostrate, displaced kidney, various lesions causing a narrowing of the intestinal tube, painful affections of contiguous parts as rheumatism of the abdominal muscles and diaphragm, fistula, fissures, ulcerations, etc., are outside the scope of this paper, as in these cases certain definite treatment, surgical or otherwise, must be adopted to remove the cause, before any prospect of cure can be hoped for.

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Constipation is so common an ailment that people do not realise that at some unexpected moment their chronic constipation, relieved by the usual dinner pill, morning saline draught, occasional suppository, enema, etc., may take on some more acute action, and cause a grave and dangerous condition, as for example, a collection of hard scybala, especially when in a more or less putrescent state, irritating that part of the canal in which it is situated, may run on to inflammation, ulceration, and even perforation, followed by a fatal peritonitis—the present fashionable disease, appendicitis, is more often than not induced by constipation, or the means taken to relieve it; an overloaded colon only waits for some slight excuse to arrive, and the mischief is done, and then only operation remains.

I may incidentally mention that the present system of cold storage for various foods, as a cause of appendicitis runs constipation very closely, in fact it is a neck and neck race between the two, as to which holds the unenviable pre-eminence of being the chief factor in an attack of this grave malady. Again, to the pressure of accumulations on the intrapelvic vessels and nerves is due many troubles which tend to make life's miseries almost intolerable, such as neuralgias, uterine catarrhs, displacements, piles, varicocele, cold feet, dyspepsia, headaches, lassitude, flushing, giddiness, palpitation, and so on.

Diet. As before mentioned, the faulty condition of the bowels inducing chronic or habitual constipation is largely due to errors of diet, hygiene, or irregular habits.

Dr. Hewes, of Boston, gives an analysis of 1,200 cases attending his clinic in the month of July, August, and September, 1902: of these 690 gave a history of chronic constipation, and of these, 660 had acquired the habit of taking a regular dose of aperient medicine to keep their bowels regular, only the remaining 30 had any knowledge of the advantages of diet, hygiene, etc., in the treatment of their condition.

The first thing we notice in these cases is that the patient takes too little water; and water is a very great factor in the cure of chronic constipation. The water should be cold, *not* hot. People troubled with constipation should take at least six to eight tumblers of cold water during the 24 hours.

Now, as to food, nature has given us 32 teeth, of these, 20 are herbivorous and 12 carnivorous, hence our diet should be a mixed one, partly flesh and partly vegetable, and the latter should form the largest portion. All food should be chewed until it is a pulp (and the dentist must see that the teeth are in sufficiently good order to do their work properly). Quick eaters do not seem to realise how important a part of digestion takes place in the mouth, and suffer accordingly.

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From the animal kingdom we get the chief part of our proteids and fat, while our starchy food comes from the vegetable kingdom.

Living as we do, or should do, on a mixed diet, the proportion of proteids would be from 100 to 150 grammes of proteids, 80 to 100 grammes of fat, chiefly derived from the animal, while from the vegetable kingdom we get from 400 to 500 grammes of starch. Now, the proteids and fats yield a very concentrated form of food with very little of any residual matter; on the other hand, the vegetable kingdom supplies us with starch, carbohydrates, cellulose, etc., which yield a large amount of residual matter, and it is to this residual matter that we look for that stimulation which excites peristalsis, and produces evacuation. This shows at once the necessity of insisting on the diet for the constipated being very largely drawn from the vegetable kingdom.

Another important reason for a preference for the diet being largely vegetable is, that certain organic acids, such as lactic, acetic, carbon dioxide, and so forth, promote peristalsis by their chemical action, are produced by such a diet. Some vegetables or fruits are especially rich in these organic acids, as for example tamarinds, plums, manna, and many others. Brown bread, whole meal bread, must be substituted for the fine white bread and rolls, as they contain more residual matter. The many cereals now in the market enable us to prescribe a good wholesome, pleasant and varied diet. By this I do not mean the many partially predigested much advertised foods, but such articles as Indian corn meal, buckwheat flour, rye flour, pea flour, and many others. From the Indian corn nice porridge is made, making a pleasant change with oatmeal porridge, also breakfast cakes which are served hot, with butter and maple syrup; buckwheat cakes and pancakes served in the same way make a delicious breakfast; rye flour either alone or mixed with ordinary flour made into bread is most useful in cases of constipation.

In very obstinate cases of constipation, amounting to or almost to complete obstruction, I have had excellent results from a diet of very thin gruels and broths, consisting of thin water gruels, not thicker than milk, and broths. These gruels may be flavoured with wine, or in fact anything the patient likes, and sweetened with syrups or sugar, coarse brown sugar for preference. No milk must be taken, nothing in fact but broths not containing vegetables or thickening of any kind, and the thin gruels made from pea-flour, oatmeal, revalenta, arrowroot, flour, etc., sweetened and flavoured to taste, from half-pint to one-and-a-half pints, to be taken every three hours or so. In all methods of treatment for constipation aperients must be stopped, as although they may and do produce an evacuation, still they remove the

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water constituents of the faeces, leaving hard, dry scybala behind, and these, when collecting as they do, form dams or points of obstruction to the regular inward passage of the faeces. To sum up, the chief dietetic treatment is—

1. Correction of bad or irregular habits; instruct the patient always to make the attempt at a certain stated time, at first taking when necessary with a little glycerine in the form of suppository.

2. Careful regulation of diet.

3. Large doses of cold water or cold thin water gruels to be taken, as they render the contents of the intestines less dry and hard, thus favouring their natural movement.

Exercise as a Factor in the Relief of Constipation.—Although regular outdoor exercise by improving the general health is useful in the treatment of constipation, spasmodic exercise or over-exertion will increase the trouble. The kinds of exercise of most value in this affection are those which exercise and strengthen the abdominal muscles, such as rowing, gymnastics, especially on the parallel bars, movements that twist and bend the trunk, flexion of the knees on the abdomen when lying on the floor, deep breathing, and so on.

Massage and Vibration.—In the treatment of constipation, massage and vibration will be found valuable auxiliary methods of cure, and, in my opinion, come next in value to electricity, which easily holds the first place. In the administration of either of these methods, the spine must receive due attention, as the dorsal, lumbar and sacral nerves control, to a great extent, the process of defecation. The same remark, of course, holds good in the application of electricity for this disorder.

In the treatment by massage, the masseur or masseuse would be instructed to begin the application by treating the spine first with effleurage down the whole spine, paying special attention to the lower dorsal lumbar and sacral portions, then following this with thumb and finger tips kneading, finishing with frictions in small and large circles. The abdominal part then follows, after giving the patient a short rest. The special movements would be fist kneading, knuckle kneading, deep digital kneading along the colon, grasping the abdominal walls as deeply as possible with the hands, the thumbs being employed at the same time in using friction to the large intestines. General petrissage of abdomen, tapotement, finishing up with vibration (hand). These movements strengthen the abdominal walls, help in producing peristalsis, stimulate the intestinal glands and lymphaties, and break up hard accumulations. If there seems to be a lack of biliary secretion, tapotement and vibration (hand) over the region of the liver and gall duct would be indicated.

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Where atony of the rectum exists, in addition to above, hand vibration directly to rectum is necessary; this is done by holding the fingers pyramidically together, and pressing them deeply down in the left iliac fossa as near the top of the rectum as possible, and imparting to them strong rapid vibrations, by contracting the muscles of the forearm.

Similar vibrations over the iliocæcal valve, and at the anus are useful, and often necessary.

Vibration or Mechanical Vibration as it should be called, to distinguish it from vibrations performed by the hand, the latter having been in the field for a much longer time, should have a prior right to the term—as with massage, our treatment should begin with applications to the spine—using a ball vibratode, with moderate pressure and a medium stroke: care must be taken to avoid contractions or pain. The applications should be made between the transverse processes on each side of the spine from above downwards; and alternately on each side of the spine; this alternation is believed to increase the effect. When the liver is to be affected, vibrate with percussion or friction in the spaces between the ribs for the posterior portion, when treating the anterior part, interrupted vibration, with moderate pressure and medium stroke using the flat disc. In vibrating the abdomen use the flat disc, with medium stroke and deep vibratory friction; this stimulates the vascular system, relieves intestinal stasis and helps to dislodge lumps and scybala; the natural course of passage of the contents of the intestines should be followed, finishing up with deep circular frictions from right to left using a large ball vibratode. The speed of the vibrator should be medium slow; internal rectal vibration is sometimes necessary, when this is required, the rectal vibratode, well lubricated, should be introduced while the machine is in motion, so as to avoid shock; care must be taken not to overstimulate the intestine or our object in producing peristalsis will be defeated. The treatment should be administered daily at first, then every other day, then every third day, thus gradually decreasing the frequency of the applications.

This description of massage and vibration is necessarily most superficial. To do full justice to these methods of treatment several papers would be necessary. My aim being only to draw attention to these very valuable aids in the treatment of constipation, I must refer you for a full and detailed account of their technique to one of the many text books on the subject.

Hydrotherapy, although an adjunct in the treatment of constipation of the utmost value, and one that will amply repay a careful study, is too full a subject to discuss in detail, in a paper such as this. I will therefore content myself by simply mentioning such measures of procedure as the high

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hip bath, abdominal pack, hot hepatic compresses, the liberal drinking of cold water and various enemata.

Electricity.—In the treatment of constipation we have in electricity a well tried, sure, safe remedy, and one that can be relied on to effectively meet all our requirements. For its successful application an accurate diagnosis of the cause of each individual case is a *sine quâ non*, as naturally cases depending on some nervous trouble will require a different mode of application to those which are simply caused by wrong diet, irregular habits, and so on. In feeding the constipated we must see that the food is such as will leave sufficient detritus, to give the muscular coat of the intestines sufficient work to keep them in a fit condition; the patient must likewise have plenty of cold water to drink. The electrical applications consist of central galvanisation and general faradisation, as a means of toning up the system and meeting various nervous affections; applications of the continuous and induced currents down both sides of the spine, in order to affect the spinal nerves that to a large extent control the mechanism of defecation. The more purely intestinal applications would be the interrupted galvanic or induced currents from the spine to the abdomen, from the lumbo-sacral region to the rectum and transversely from one side of the abdomen to the other; for faradic applications I generally use a coarse wire primary coil—intrarectal bipolar induced currents, the primary and secondary currents combined. Intrarectal galvanic currents are very necessary applications, using the negative pole when one object is to neutralise an excess of acid, for attracting moisture, softening tissue, etc.; to get electrotonic contractions interrupt the current slowly. The positive intrarectal pole would be called for in hæmorrhage from the rectum, a flabby mucous membrane, etc. As there is always a danger of injuring the mucous membrane when using metal electrodes, especially with the negative galvanic pole, I usually fill the bowel with water making the intrarectal poles a piece of wire with a knob at the end, which I insert in a vaginal tube attached to an ordinary Higginson's enema syringe.

In painful conditions of the lower bowel use faradic current; stricture of the rectum would, of course, be treated by electrolysis, using the negative pole to the stricture; piles, fissure pruritus, eczema of anus are best dealt with by high frequency currents. Triphase and sinusoidal currents have also been used with success in the treatment of constipation, so also by the static current in the form of a wave current or Morton's static induced. High frequency currents beyond being useful and curative in local affections of anus and rectum does not seem to have any value in the treatment of constipation.

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In my experience, however, I find I have in the continuous and induced currents everything that can be desired or wished for in the treatment of constipation.

In conclusion, I may mention that as a preliminary to any of these modes of application, especially in chronic cases, where inspissation is nearly always sure to be present, copious high injections are most valuable.

In the discussion which followed, Dr. HORACE MANDERS said: Though constipation is truly often due to the careless habits of the sufferer, it is far too often the case that in females the habits have been acquired by the closet accommodation of schools being too scanty, the consequence being that the little girls are prevented by the elder ones, and so the habit of retention is acquired. The female pelvis being much more capacious than the male, the presence of fæces therein does not cause that condition of irritability seen in the male.

The most efficacious treatment is the de Watteville current, *i.e.*, the simultaneous galvanic and faradic, which often causes an immediate action at the close of the application.

In order to combine massage with electricity, he had devised a roller consisting of a hollow ball fitted with a screw for the purpose of admitting that in order to increase the weight for these patients. This ball can be used by the patient in a simple manner by rolling it up the ascending colon, across the transverse, and down the descending colon. When mounted on swivels attached to an insulating handle it can be used with any form of electricity.

Dr. MCCLURE, thanking the President for his paper, thought that of electrical methods the constant current seemed the first indicated; high frequency contraindicated. Static sparks, in his experience, gave good results. As to faradism, one failed to see how it could reach the intestine at all.

Dr. A. HEYGATE VERNON said that although galvanic and faradic currents were generally admitted to produce the best results in the electrical treatment of constipation, high frequency currents may be applied with advantage in certain special cases. Some people appear to have difficulty in getting the bowels to act through a hypersensitive condition of the mucous membrane at the anal orifice, in some there was a condition of eczema, or slight fissure, but in others nothing abnormal could be seen. By paralysing the sphincter by dilatation, or the application of a local anæsthetic, the passage of the motion became easy and painless. Direct application of high frequency currents by means of a glass electrode cured the local condition, and so relieved the constipation.

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Mr. HIGHAM COOPER had found faradic most useful, placing electrodes over the lumbar region and abdomen, varying strength of current by a movable core, and producing 40 to 50 contractions of the abdominal muscles at a sitting. High frequency currents should be used in cases complicated with hæmorrhoids or other local condition; in these, constipation usually vanished with the piles. He agreed that its most beneficial action was solely due to relief of irritability of rectum as "general" high frequency currents often caused constipation.

Dr. LEWIS JONES referred to two cases in which direct current to the abdomen had produced favourable effects, and said that in both of them there was evidence of the effect of the electricity upon the intestine, for borborygmatous gurglings and intestinal movements could be seen during the course of the application.

He also mentioned that he was once consulted by an engineer who told him that severe applications of induction coil currents to the abdomen had proved the best treatment in his own case.

The discussion clearly showed that there was still much to learn as to the best methods of applying electricity for the relief of obstinate constipation.

NOTICE.

Members taking part in discussions or making remarks on papers, etc., are earnestly requested to give their notes on same to the Secretary at the end of evening, so that the proceedings may be complete and not delay the prompt publication of the Journal.

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MEDICAL

Electrology and Radiology.

No. 4. APRIL, 1905. Vol. VI.

EDITORIAL.

In the treatment of malignant disease it can fairly be claimed that the employment of X-rays has passed beyond the experimental stage. Much remains to be done. Many details require to be worked out and, above all, careful reports of results need to be collected. There is, however, a phase of the treatment to which insufficient attention has been given—namely, the employment of the rays for the prevention of recurrences. The fact that many cases of recurrence of carcinoma of the breast have been known to clear up under this treatment is in itself evidence that the rays have an inhibiting effect on the growth. It is but one logical step from this to the employment of X-rays after operation for a recrudescence in which the surgeon is doubtful whether the disease has been completely removed. This step naturally leads one to recommend the patient to undergo a course of X-ray treatment in those cases in which the disease has been apparently completely eradicated, but absence of recurrence cannot be guaranteed.

This practically comes to recommending in all cases of malignant disease a course of X-ray treatment after operation, in the hope that thereby we materially increase the patient's chance of a permanent cure. Statistics as to the value of this method are not at present available, but their compilation would be extremely valuable. Further, taking as an example cancer of the breast, we are dealing with a large variety of malignant tumours. Omitting the rarer forms, and restricting oneself to the cubical-celled carcinoma, we still have a great variety in the type from tumours in which there is abundant formation of fibrous tissue and consequent atrophy to those in which there are large masses of cellular elements, or strands of cancer cells with but little fibrous tissue around them, and it remains to be proved which of these is most amenable to X-ray treatment. The decision on this point will enable us to give a much more accurate prognosis in these cases.

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THE X-RAY TREATMENT OF RODENT ULCER & CANCER.

By J. HALL-EDWARDS, L.R.C.P., etc.

Surgeon X-ray Expert to the General and Royal Orthopædic Hospital, Birmingham, and late to the Imperial Yeomanry Hospitals in South Africa.

Further experience in the application of the X-rays to the treatment of rodent ulcer and other forms of superficial cancer has tended, on the one hand, to clear up some points which were previously obscure; and on the other to raise fresh issues upon which we still require enlightenment, and of which we have much to learn. There can now exist no doubt as to the beneficial effects to be obtained from the scientific application of the X-rays in many superficial lesions, but we still have much to learn as regards the best methods of application, and the proper dose to administer. In many cases the X-rays act almost as a specific; but, like all "specifics," they occasionally fail to produce the desired result. These few exceptions may, however, be taken as those which go to prove the rule.

The causes of non-success in certain cases are not difficult to understand, and with increased knowledge we may be enabled to combat them. A far more important question is that of recurrence in cases which to all intents and purposes have been cured, and this frequently after only a few months' freedom from distressing symptoms.

Before entering into a discussion upon the methods of treatment now in vogue it may be well for me to "hark back," and, to an extent, modify some of my previous statements. In a paper of mine, published some eighteen months back, I said:—

"The dangers of setting up too severe a reaction in cases of rodent ulcer have, in my opinion, been vastly overestimated. That there is a danger I will admit, but the possibility of this should not influence workers in using the rays in suitable cases. The use of tubes of low vacuum is, we are told, to be strenuously avoided, and short exposures with very hard tubes is generally recommended. The choice of a tube for any given case can safely be left in experienced hands; the novice, however, should never use a soft tube. In certain cases which have failed to respond in reasonable time to a hard tube I have found the judicious use of a soft one to yield beneficial results."

The only point I wish to emphasise here is in regard to the use of "soft" tubes. I have found them increasingly useful, more especially when used in conjunction with a mechanical mercury break. Tubes so rapidly become hard when constantly used with an electrolytic interrupter

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(which until lately I have constantly employed), that it was exceedingly difficult to determine the full effects of tubes of any given degree of softness.

If "soft" tubes are to be used so as to obtain their full effects, they must even under the most perfect conditions be constantly replaced by new ones, as no tube, which has commenced to get "hard," can be again brought into its original condition, unless it be filled with air and be then re-exhausted.

The vacuum of a tube can certainly be lowered by means of certain subsidiary tubes, which give off vapour or gas when the spark is made to pass through them. In these self-regulating tubes the vacuum may be lowered even past the point of "softness," yet they never produce again the results which were at first to be obtained from them. How is this? Sir Oliver Lodge has pointed out that in addition to X and other rays which come from an excited tube, a certain number of cathode rays pass through the glass, and these carry with them ions, knocked from the atoms contained in the vessel. No matter how many atoms are admitted to replace the lost ions, the contents of the vessel will ever afterwards consist of a mixture of (what we may term) damaged and complete atoms, and the conditions which at first existed cannot be reproduced unless it be filled and re-exhausted.

It has recently been asserted by manufacturers of a certain class of apparatus that the same conditions can always be repeated by measuring the amount of current taken by the tube. This must be incorrect; for as a tube is ever and always changing from a "soft" to a "hard" condition, it must follow that one state cannot be maintained by any regulation of the amount, or tension, of the electrical current passed through it. Could we by any means maintain a given condition for even a limited time we should be in a position to administer measured doses with at any rate some degree of certainty.

I freely admit that the measurement of the amount of current passed through the tube is of importance, and gives a much better idea of the condition of things than did the old method of measuring the amount of current taken through the primary of the coil.

Quite recently we have had introduced at least two important instruments of precision to aid us in measuring doses. The radiometer of Benoist, and the chromo-radiometer of Holzknecht. I need not enter into a description of these useful adjuncts to therapeutic X-ray work. I may say, however, that they mark a distinct advance, although they fall far short of being ideal; their great drawbacks being that they are difficult to manage, are expensive to work, and that in their interpretation the "personal equation" plays an important part.

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These instruments have not as yet come into general use in this country, although they are largely used upon the Continent. When they have been improved and generally adopted we shall be in a position to judge of one another's methods, and to make comparisons to our mutual benefit.

Quite recently another method of measurement has been advised by Dr. Lewis Jones, in a paper read before this Society.

Even should we agree that the method is a practical one, we have much to learn. In the first place no reverse currents must be allowed to pass, and in the second one arrangement for regulating the passage in one direction must be constant. At the present time the vacuum of the regulating tube is constantly undergoing alteration, so that the measurements must be ever varying, and can only be taken as being approximate. I am now experimenting with this method, and shall hope on some future occasion to say more about it. The introduction of a spark gap, I think, is likely to give a more correct reading than by the use of a Villard tube.

The question of the necessity or non-necessity to produce a limited dermatitis before a cure can result is one which still occupies a prominent position. On this point there exists much difference of opinion, all the same I have no reason to change mine that a limited dermatitis is a *sine quâ non* to successful treatment. I have been called to task several times for sticking to my guns, and in the course of arguments urged against me I have found that the question largly hinged upon the meaning of the word dermatitis. I take it that any inflammation of the normal skin is a dermatitis, which may vary from a single erythema to absolute necrosis of the tissue. I find that nearly all the workers with whom I have been brought into contact admit that no, or very little, result shows itself until the unaffected skin round the diseased area exhibits signs of (erythema) dermatitis.

Mr. Malcolm Morris, in a paper read before the Harveian Society, has pointed out that the general principle of the up-to-date treatment of such superficial lesions, as come within the scope of this paper, may be expressed in the single word reaction. "Reaction," says Mr. Morris, "is a force which can work wonders if properly directed and controlled. In the present state of our knowledge we are but imperfectly able to control its operation." "The clinical phenomena seem to me to warrant the belief that some part at least of the beneficial effects of the X-rays is due to the reaction which they excite." Personally, I have always entertained this view, and am pleased to note the emphasis laid upon it.

It has been held that although the X-rays themselves are alone responsible for the therapeutic effects (with perhaps

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some little help from the highly electrically-charged area which surrounds the tube), the burning effects are produced by entirely different rays. Be this as it may, I still feel that there is no getting away from the fact that a limited dermatitis is the best sign (as yet introduced) of proper dosage.

It has over and over again been shown that some persons are less responsive to the action of the rays than others, that is to say, that idiosyncrasy is an important and not to be overlooked factor. This being the case, even with the most perfect method of measuring dosage, we are in no better position than the physician when ordering ordinary drugs. Not being a homœopath I take it that the administration of any remedy is useless unless at least a physiological result is produced. No general law can be laid down for the administration of such drugs as opium, quinine, or the salicylates, and although we have an accurate and scientific method of measuring the doses of such drugs, and have their minimum and maximum doses set before us in the British Pharmacopœia, we should still be working in the dark were it not that judgment based upon experience is our guiding star. Whilst one patient cannot tolerate the minimum dose advised, another gets no effect until three, four, or even more times the maximum is exceeded. For this reason, in the cases herein quoted, the frequently repeated small dose has been universally used, in contradistinction to the larger accurately measured dose as now generally given on the Continent.

No matter what is the direct cause of the changes which take place in all superficial and in some deep-seated cancerous growths under the influence of the X-rays, there can be no gainsaying the fact that the results produced are far in advance of those which can be produced by any other method at our command. To anyone who has carefully watched the alterations which take place in, say, an epithelioma, the results are little short of marvellous, even if they fall short of bringing about a complete cure in any special case.

Before attempting to discuss the effects of the application of the X-rays upon superficial epithelioma it is necessary that I should clear the ground by attempting to describe what we in this country call epithelioma, as distinct from rodent ulcer. In America and on the Continent no distinction is made between the two diseases, and nearly all the cases which we call rodent ulcer here are there called epithelioma. Hence the cure of this disease is spoken of by our confrères as a simple process. Rodent ulcers, from a clinical point of view alone, vary very considerably, and should undoubtedly be divided into classes. Their clinical and pathological appearances differ greatly, according to the soil in which they grow. In a large majority of cases they make their appearance in healthy subjects, when they run a clearly defined course. But

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when they appear in unhealthy or diseased subjects they manifest differences in rate of growth, and in clinical and pathological appearances to such an extent that they frequently are unrecognisable. We hold it, as a rule, that a rodent ulcer, pure and simple, never infects contiguous lymphatic glands; and that, should glands be affected, the disease (no matter how far it simulates rodent) must be epithelioma. It would be wasting your time, and be far from the scope of this paper, did I attempt to discuss the accepted views of the differences between rodent ulcer and epithelioma, but it is pertinent to point out that no line of demarcation can be drawn between these diseases, and that inasmuch as the pathologist is unable to give us any material help in difficult cases, we must be guided by our own experience, or by the diagnosis of the cases sent to us for treatment, made by the surgeon who sends them, and that, therefore, our published results of treatment must be taken in good faith, with an absence of absolute knowledge.

I lay emphasis upon this point because my work has been continually hampered by divergence of opinion. Many cases have been sent to me without a diagnosis; if I have cured them they have been pronounced rodent ulcers; if I have failed, or have been only partially successful, they have been called epitheliomas, or something else. In a case I shall show you lantern slides of later on (which was seen by dozens of surgeons), no diagnosis was forthcoming. The X-rays cured it, and the final diagnosis was malignant adenoma. All had pronounced it malignant before treatment was commenced, but no one would give it a name in spite of the fact that sections of the tumour had been examined. It was at first sent to me as a rodent ulcer, but microscopic examination proved it to be nothing of the sort, and whilst it was far more like epithelioma (as we know it), the history contraindicated such a diagnosis. That it was malignant all agreed, and there their diagnosis ended. Now that it is completely cured some doubts have even been expressed as to its having been malignant.

I don't know how you manage these matters in London, I, however; find that much of my work is rendered useless for publication from the fact that I fail to obtain a substantial diagnosis; for although in most cases I form my own views, I hesitate to stick to them in the face of the various opinions which are frequently given.

In speaking of so-called inoperable cases of rodent ulcer and epithelioma, I am convinced that if a successful issue is to be arrived at the surgeon and the X-ray expert must work hand in hand. A surgeon calls a case inoperable which he cannot cure. In such cases he can, however, do something, and if he will only consent to our doing the rest

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I feel assured that we hold success in our hands. In many cases of large ulcers upon the face which had not penetrated so deeply as to attack the bone, the greater part of these area has yielded immediately to the action of the rays, but one or more small foci have failed to heal after even prolonged application. If the patient is sent home with these small areas unhealed it has almost invariably happened that in a short space of time (from one to four months) the whole area has broken down and there is always the greatest possible difficulty in again healing it. A case in point :—

Case 1.—Mrs. S. A. J., aged 52. The patient has always enjoyed excellent health and at the present time is as well as she has ever been. There is no family history of phthisis or cancer.

Between four and five years ago she first noticed a small "pimple" on the right cheek one inch below the outer canthus. This slowly enlarged, and to use her own words "used to gather up and discharge." Treatment with ointments and lotions failed to have any good effect upon it. A small ulcer formed which was treated with caustics. The ulcer then began to enlarge and has continued to do so until the present time. Eighteen months back she attended another hospital and had a number of applications of the X-rays, with no effect.

At the time of commencing treatment the ulcer measured one and a half inches in length and an inch and a quarter in breadth. It occupied the upper part of the right cheek a quarter of an inch below the eye. A space of half an inch of healthy skin existed between the upper edge of the ulcer and the edge of the lower eyelid. The edges of the ulcer were raised, but only slightly indurated. In the upper and outer corner there was a deepish hole, and the lower and inner corner near the nose showed some bare cartilage. The ulcer showed no signs of granulating, its surface being covered by a semi-purulent slime. It bled freely when dressed.

Treatment was commenced on October 3rd, 1904, the face with the exception of the ulcer being protected from the rays by means of a mask made of plaster of Paris bandage, covered with several thicknesses of tin or lead-foil. At the end of November the ulcer had completely healed, with the exception of the two corners previously mentioned, and these have even up to the present time resisted X-ray treatment.

Up to the end of January 40 applications of from five to ten minutes' duration had been given, at a distance of from four to six inches from a mediumly hard tube.

I mention this case as an example of the class in which the surgeon can, or could, offer us considerable aid. The case was admittedly an inoperable one, that is to say, that no surgical operation could possibly cure it ; but had the whole

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surface been well scraped with a Volkman's spoon, and the wound been as far as possible rendered aseptic, I have no doubt that the X-rays would have done the rest.

At this point I should like to say that it has long occurred to me that a great improvement in our methods might be brought about could we but secure a degree of asepsis in our ulcers before and during treatment. Unfortunately, rodent ulcers rarely occur in the "well to do," hence they but rarely come to us as private patients. In private practice the cases which present themselves are easily curable, and moreover, when once cured they rarely break down. In such practice I have no notes of any case having broken down after having once been cured. In hospital practice things are different. Patients neglect themselves until the ulcers have become large and inoperable, and they are rarely kept even reasonably clean. There can be little doubt that in a large number of cases dirt is a predisposing cause, and I would here like to draw your attention to a fact that has impressed me during the last few years, namely, the large percentage of cases (amongst men) which occur in colliers, or haulers of coal. The only record I have of two cases occurring in one family, both the patients were colliers, and, moreover, in both instances, although the ulcers were small and easily healed under the influence of the X-rays, they both recurred. I cannot help but think that rodent ulcer is closely allied to the penile cancer of the sweep, which has been to a great extent stamped out by legislation.

In contradistinction to the case I have just laid before you I should like to call your notice to one in which surgical aid has brought about the most excellent results. The case is one in which a rodent ulcer involved the eyelids and eye to such an extent that the patient was quite blind, and stood a good chance of losing her life.

Case 2.—A. E. S. Female, aged 27 years. When nine years of age a small ragged wart appeared upon the lower eyelid, close to the inner canthus. This grew to such an extent that it became a disfigurement, and her father pinched it off. Several warts later appeared in its place, and ultimately the whole lower eyelid was involved. These growths were removed upon three occasions at a hospital devoted to diseases of the eye. The growths continued to grow until both lids were completely involved.

Present Condition.—August 22nd, 1904. Both eyelids are covered with a mass of warty pedunculated growths. The lids are thickened and discharge freely. The cornea is opaque, and the sight gone. The edges of the growth are slightly raised and indurated, the fur edges of the lids are thickened. The conjunctiva is soft, pulpy, and deeply injected. The condition bore little resemblance to rodent ulcer,

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and was diagnosed as a papiloma. I early formed the opinion that the case was one of rodent ulcer, and advised the snipping off of the redundant growths prior to the commencement of X-ray treatment. This was done, and some of the pieces were submitted to the pathologist, who reported it a typical rodent ulcer. X-ray treatment was commenced four days after the operation. Thirteen daily exposures of ten minutes' duration, at a distance of from four to six inches from a mediumly "hard" tube. The patient was then sent to her home (in the country), and was told to come to the hospital again in a fortnight. By this time the lids were completely healed, and had assumed an almost normal appearance. The condition of the eye, however, was little improved, and I came to the conclusion that it would be better to remove it, but decided to wait and give it a chance. About the middle of January of the present year the eyelids were practically normal, but the eye remaining the same I tried to persuade the patient to have it enucleated; after consideration she decided to take my advice, and it was removed on February 1st, by Mr. Lloyd Owen. On February 14th, although there was but a slight sign of the presence of rodent, and this situated upon the side of the nose at some distance from the original sight, I decided to give another series of X-ray exposures. Ten applications of ten minutes' duration were given, and when I saw the patient a few days since there was no sign of the existence of malignant disease, and the patient expressed herself as being more comfortable than she had been for years. The socket from which the eye had been removed showed no signs of disease.

Whilst I freely admit that in this case all has been done that could be advised with our present knowledge, and that the results achieved are excellent, I have misgivings as to the future ending of the case, and cannot but feel that with the methods and appliances at my command, better results might have been achieved. I have previously said, and I wish here to emphasise the statement, that in the X-rays we have at our command one of the most potent therapeutic agents as yet placed at our disposal; but I feel that so far our methods of dealing with them are crude and imperfect, and that we have much to learn before we can be in a position to deal with them in a satisfactory manner.

During the last twelve months I have experimented with many kinds of shields for protecting the unaffected parts, and I must admit that in my hands they have been more or less failures. In no case where I have used a tube of any sort to limit the rays to the diseased area have I found the results satisfactory. In some of these shields various metal parts are used. I find that these interfere with the proper passage of the current through the X-ray tubes, which rapidly

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deteriorate and become useless. The effects produced with these arrangements have no comparison with those produced with a naked tube. I have therefore gone back to my masks of plaster of Paris and tin-foil, and as an additional precaution against the production of accidental burns I also use screens made of two pieces of cardboard with from six to twelve sheets of tin-foil placed between them, a hole being made through their centre considerably larger than the one in the mask. These are held between the tube and the mask by the special holders I have already shown you. Should I wish for further protection I place several of these screens (without holes in them) round the tube, thus protecting the patient and myself at the same time.

I think that there can be little doubt that the rays, which on prolonged exposure produce the ill effects, and are the direct cause of chronic dermatitis, are the rays which when applied scientifically also produce the good effects. That the deeply penetrative rays are the least harmful and the most tardy in bringing about therapeutic effects is evident from the fact that I have so far produced no burn when using the masks I advise, although when a hard tube is in use it is easily proved by the aid of a fluorescent screen that quite a large percentage of rays find their way through the protective screen, mask, and head of the patient. Granting that a number of cathode rays emanate from a tube in action, it is highly probable that these are the active factors in the production of therapeutic results, and it follows that a tube which gives off the greatest number of these rays is the most useful one.

That the deeply penetrative rays have an effect is proved by the fact that pain is in a large number of cases relieved by them, and in the absence of a screen, or when using a screen with a comparatively large aperture, other effects are produced, which point to the fact that a continuance of experiments in this direction may yield unlooked-for results.

I have treated many cases of deep-seated cancer, and although the results will not compare with those obtained in superficial lesions they are sufficiently encouraging to call for further investigation.

Case 3.—A. Z., a lady of 60 years of age, with a growth in the rectum which could only just be reached by the finger, was sent to me for treatment by a London specialist, who, in his letter to me, stated that the patient (in his opinion) would live at the most three months. Ten-minute exposures at a distance of from four to six inches from a mediumly soft tube were given on alternate days through a tin-foil screen with a circular opening four and a half inches in diameter. The exposures were made over the sacrum, behind which the growth was situated. After about a dozen exposures there

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was a slight dermatitis, and the exposures were stopped for a month, during which time the patient was perfectly easy with the exception the slight soreness caused by the dermatitis. At the end of the month all signs of dermatitis had disappeared, but there was a well-marked area of pigmented skin corresponding with the circular opening in the screen. Treatment was recommenced and was carried on until a slight dermatitis again appeared, when a period of rest was again prescribed.

After six months' treatment the patient again visited the specialist, who reported that the growth had not increased in size, and that the patient's general health had considerably improved. Two years later I was informed that the patient's condition had not materially altered.

I have now lost sight of the case, but I watched it carefully for two years, and am convinced that the treatment was not only useful in alleviating the pain, but in altering the rate of growth of the tumour.

I may say here that I have long held the opinion that, apart from the direct action of the X-rays upon the growth itself, they bring about general constitutional changes in the patient, which in many cases are productive of beneficial results. After even a few applications I have repeatedly noticed an improvement in the patient's general condition. She has slept better, and has been able to take more food, and in some instances there has been a gain in weight. In how far these constitutional changes have influenced the growth of the tumour it is difficult to estimate; it may be that to them alone the effects of the X-rays upon deep-seated growths is due.

Case 4. Primary Carcinoma of the Liver.—J. H., male, 40 years of age, came to me for X-ray treatment, which had been recommended by his surgeon early in January, 1904. At the time he first visited me there was a tumour over the liver, about the size of a large orange. The patient was thin and emaciated, there was marked cacexia, he complained of great pain, and inability to sleep, even after administration of large doses of morphia. X-ray treatment was administered as in the previous case, and after a few applications his pain disappeared, and he slept much better. A slight dermatitis occurred after the 15th application, and a rest was given.

The growth was first discovered at the end of October, 1903, and during the next two months it had grown so rapidly as to present the appearance I described early in January, 1904. At the rate of growth it must have killed the patient in a few weeks; yet, under X-ray treatment, he lived seven months.

I must admit that the end came suddenly and to an extent

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unexpectedly. Within two or three days the size of the growth suddenly increased and the emaciation became marked to such an extent that I informed his wife that unless he was better it would be unwise for him to visit me again. He did not do so, for on the following day he suddenly expired.

Whilst it is generally acknowledged that it is next to impossible to predict the ending of such a case, I cannot but think that the treatment adopted materially lengthened the patient's life, and made it more bearable.

I have by me the notes of many cases in which X-ray treatment has apparently done much good; on the other hand, in some instances it has brought about symptoms of toxæmia, which have rapidly proved fatal.

I should spin out my paper to far too great a length, did I venture to lay before you the conclusions I have formed as to the different effects produced, in the various cases I have treated. I may, however, state that it is impossible to predict the effects (other than those of relieving pain) in any deep-seated case of malignant growth; nevertheless, on the whole, I am convinced that continued experiment will yield better results.

Amongst some of the most successful cases I have treated with the X-rays I could mention a number of superficial recurrent malignant tumours of the breast. Indeed, my experiences in this direction have been so satisfactory that I have no hesitation in advising a course of X-ray treatment as soon as possible after the amputation of a breast in which there is even a possibility of recurrence. I have seen quite a number of nodules (in some cases as many as fifty) entirely disappear after a few weeks' treatment.

In reporting the effects of the X-rays upon deep-seated malignant growth it is necessary to use the greatest possible caution not to mistake the vagaries of this extraordinary disease for effects produced by treatment. It does not do to depend upon the statements of the patient, uncorroborated by recognisable alterations of condition, or one may be led astray, and may during a wave of enthusiasm publish results which are not only misleading, but even damaging to the cause we have at heart. I feel that this has already been done to an extent which has done us much harm, and I have therefore devoted much of my space to failures, as I consider that these frequently are of greater importance than successes.

There is a growing need at the present time for more painstaking research in the scientific application of electro-therapeutics to the treatment of disease, for as more and more is written it becomes more and more difficult to sift the wheat from the chaff. One might be led to imagine that in the application of electricity to medicine one had struck a panacea for all evils, but to us it is patent that whilst the forces at our

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command are great, they have limitations which up to the present are so well marked that to overstep them is not only foolish, but sinful and damaging to our interests. I wish to lay stress upon this point because I am convinced that in many cases recently published the authors have allowed their enthusiasm to run riot with them, greatly to the disadvantage and detriment of the advancement of our cause. It is even difficult, no matter how exalted our motives, to escape falling into error. Painstaking research is certain to bring forth good results, and it is to be regretted that more facilities for the same are not placed at our command.

DANGER OF TOO PROLONGED OR TOO CLOSE AN EXPOSURE TO X-RAYS.—M. Audin shows that in X-raying large cancerous masses (epithelioma or sarcoma) it is necessary at first to make the sittings short, and at considerable intervals in order that the organism may have time to eliminate the products set free. He has seen toxic effects following a rapid decrease in the size of the tumour; feverishness, loss of appetite, malaise, scanty and albuminous urine, cough, vomiting. These disappear after a few days' rest, but if, in spite of the appearance of these troubles, the treatment is persisted in, or if the early exposures have been too prolonged, there is produced a general infection of the system which may be fatal in a few weeks.

* * *

X-RAYS IN THE TREATMENT OF RIGG'S DISEASE.—W. Guy (*Soc. d'Adontologie*) reports cases in which the good effects of treatment have been manifest from the very first sitting. After 21 exposures of from three to five minutes the teeth became fixed and the gums firm and hard, the extreme sensitiveness to heat and cold disappeared and the case got well.

* * *

THE X-RAY TREATMENT OF KELOID.—The removal of cicatrical keloids is often followed by a tendency to recurrence and in a form even more extensive than the original lesion. According to Dr. W. M. Harsha (Chicago), raying will prevail recurrence as well as produce a manifest diminution in such tumours as are already formed. For instance, in the case of a young man in whom it had become necessary to remove a recurring keloid in the mastoid region raying every two or three days caused a manifest improvement, on its recurrence for the third time, the size having fallen to one-sixth of its original bulk. In a series of analogous cases Dr. Achsner, Professor of Surgery at the College of Physicians and Surgeons, Chicago, has obtained results not less satisfactory. W.S.H.

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A CASE OF SPLENO-MEDULLARY LEUCOCYTHÆMIA TREATED WITH X-RAYS.

By W. IRONSIDE BRUCE, M.D.Aberd.

Physician to the Electrical Department at Charing Cross Hospital.

Rose M., married, aged 23, was admitted on September 10th, 1904, to Charing Cross Hospital, under Dr. Mitchell Bruce as a case of splenic leucæmia. Her history previous to admission was briefly as follows. On February 17th, 1904, she was confined. On April 1st she noticed a slight swelling of her abdomen which gradually continued to get larger. She had attacks of dyspnœa and palpitation, and began to lose flesh considerably. She had been troubled with epistaxis from childhood. Menstruation had not returned after her confinement. On admission, she looked extremely anæmic, thin and ill. Her abdomen was greatly increased in size. The spleen extended nearly to the pubes, and within half-an-inch of the median line at the level of the umbilicus. It was very slightly tender on deep pressure and rather ill-defined in outline. Urine was acid, S.G. 1,022, no albumen. Uric acid in excess. Aortic and mitrial regurgitation were well marked on examining heart. Blood examination showed red cells 2,300,000 per cmm., white cells 1,440,000 (myclocytes 34·4 per cent., polymorphonuclears 52·2 per cent., eosinophiles 6 per cent., nucleated red corpuscles 6 per cent). Poikilocytosis was fairly marked. Hæmoglobin 34 per cent. With a slight rise in the evenings the temperature fluctuated between 98° and 100°. After three weeks in the wards it was decided on October 9th to try X-ray treatment, patient still being unable to leave her bed, and her condition much the same as described above. Ten-minute exposures with a hard tube over the splenic area only, with the tube about nine inches away, were given her every day till the end of October, with an interval of six days after the first nine days. On October 16th she was able to get up, and on October 28th to be discharged from hospital, her condition then being R.B.C. 3,020,000, W.B.C. 232,000, hæmoglobin 37 per cent. Poikilocytoses was much decreased, and the myclocytes greatly diminished. The spleen was appreciably smaller in size, being fully an inch and a half smaller towards the pubes and better defined in outline. Since her discharge she has been able to walk to the hospital and attend for treatment as an out-patient, which she continues to do now. Exposures of ten minutes over the splenic area only are given her each day on alternate weeks. The result has been exceedingly gratifying. In December her menstruation reappeared, and has continued regularly since. Her blood counts in January was R.B.C. 3,842,000,

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W.B.C. 96,000, ratio of white cells 1 : 40. Myelocytes had fallen to 27 per cent., polymorphonuclears risen to 61 per cent., hæmoglobin 44 per cent. On February 21st R.B.C. 4,750,000, W.B.C. 42,200, myclocytes 23 per cent., polymorphonuclears 63 per cent., ratio 1 : 113. Hæmoglobin 46 per cent. Spleen is much diminished in size, being fully four fingers' width from the pubes, and about an inch and a half from the umbilicus, and is more sharply defined now. She is looking better, and says she feels much improved.

THE INFLUENCE OF RADIUM ON VENOMS.—Phisalix has studied the action of radium on different venoms, in particular on those of serpents and batracians, and he arrives at the conclusion that snake venoms which are of an albuminoid nature are completely destroyed after a few hours' exposure to the emanation of radium. The germs contained in solutions of these venoms are also killed. On the other hand, the venom of the salamander, which is of an alkaloidal nature, is in no way affected by radium ; neither is that of the toad.

[This bactericidal action of radium is extremely questionable ; many English observers, notably Soddy and Mackenzie Davidson, absolutely deny that it possesses any.] R.H.C.

* * *

TO REGULATE THE VACUUM OF CROOKES' TUBES.—Bunsen has studied in an extensive series of experiments the capillary attraction that a glass surface exercises upon gases ; and he has shown that the extent of absorbing surface of a glass receiver can be increased by introducing into it filaments of glass such as those which are employed in the manufacture of glass fabrics. M. Krouchkoll suggests the application of this fact to the regulation of vacuum tubes. He attaches to the vacuum tube a small glass reservoir communicating with it and containing a certain quantity of the glass fibre in question, when the tube becomes hard from use it is sufficient to warm the auxiliary tube or receptacle containing the fibre to bring down the vacuum of the focus-tube. The tube containing the glass thus becomes a reservoir of gas for the vacuum tube. Such an arrangement supplies a simple means of automatic regulation. When the anti-cathode becomes warm the heat is sufficient to set fire a little gas from the glass filament and thus the condition of the tube is maintained constant during a considerable time.

[MM. Dewar and Tait have shown that wood carbon has the property of absorbing certain gases; so much so that under certain conditions a vacuum can be produced so high that an electric spark fails to traverse it.] W.S.H.

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NOTICES OF BOOKS.

L'ANNÉE ÉLECTRIQUE, ÉLECTROTHÉRAPIQUE ET RADIOGRAPHIQUE, par le Dr. Foveau de Courmelles. (Béranger, éditeur, 15, rue des Saints-Pères, Paris.)

Of all our "hardy annuals" this is one of the most welcome. It comes to us as an old and tried friend, for it has now reached the fifth year of publication, and upon this latter fact both its author and his readers are to be congratulated. No one can feel quite abreast of electrical progress from the medical standpoint, nor fully conversant with the electrical happenings of the past year, who has not had the privilege of access to these instructive pages. All that is newest and best in the scattered and voluminous pages of recent periodical literature is here condensed and presented in solid and orderly array. Exhibition first receives attention, and then the readers' attention is directed to new apparatus and new facts in electrical science. Electro-chemistry, electric lighting, electric heating, electric traction, telephones and telegraphs, electricity obtained by the power of wind and of water; the employment of electricity in the arts, therapeutic-electricity, radiography, radiotherapeutics, X-rays, phototherapy, radium jurisprudence, each form the subject of a separate chapter. We cannot do better then help ourselves to a few extracts taken almost at random from such a mine of useful and interesting information.

* * *

At the Clinical Society of London Meeting, held March 24th, 1905, Dr. NORMAN DALTON and Mr. A. D. REID read a paper on "A Method of ascertaining the Position and Size of the Stomach by means of the X-rays and a tube filled with Subnitrate of Bismuth." The method had only been employed in those cases in which an empty stomach tube would be used for diagnosis or treatment. The method was as follows: The ordinary stomach tube was passed once a day for two or three days beforehand so as to accustom the patient to its presence in the stomach. The stomach being empty, the patient lay on his back, while the X-rays were situate beneath the couch. The bismuth tube is then slowly passed into the stomach while the epigastrium is watched through the fluorescent screen. In a typical case the tube could be seen to emerge from beneath the ribs a little to the left of the middle line, and then to descend until it reached the greater curvature of the stomach rather to the left of the umbilicus. Then the point of the tube slid upwards and to the right along the pyloric end of the greater curvature, while the stem became convex towards the left. When the point became arrested at the pylorus, the rest of the tube adapted itself to the greater curvature, and the photograph of it in that position gives practically a representation of the greater curvature. The umbilicus is marked out by a metal disc and the curve of the ribs by metal wire so as to give bearing

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points. Lantern slides taken from the photographs were exhibited, showing the tube in various positions in the stomach. In one the curve and position of the tube indicated gastroptosis. This was verified at an operation for gastro-jejunostomy. In another it showed great gastroptosis with gastrectasis. In another, moderate gastrectasis, which was found at an operation to be present and to be due to old pyloric adhesions. In another, great gastrectasis. In one case the point of the tube was permanently arrested at a position close to the umbilicus, and it was found at the operation that the pylorus was actually situated there, being enveloped in a dense mass of adhesions. Subsequent experiments showed that in the cadaver the tube pushed the greater curvature before it, so that the point did not ascend towards the pylorus, but remained at the umbilicus. It is therefore probable that in an extremely atonic stomach the tube would not pass beyond a point corresponding to the umbilicus. Slight retching on the part of the patient will often disengage the point of the tube and facilitate its gliding movement up to the pylorus. Great retching, of course, prevents the photograph from being taken, but does not interfere with what is seen through the fluorescent screen. In other cases it had been proved at operation that the curve of the tube gave a faithful delineation of the greater curvature. No photograph of the tube in a normal stomach had yet been obtained, because so much of the stomach is covered by the ribs, diaphragm, and left lobe of the liver that the shadow is faint. In one case the tube was distinctly seen, and its position and curve indicated that the stomach was normal in these two respects, and the operation showed that such was the case; but the photograph was not successful. The tube was as flexible as an empty one, but heavier. It had not been possible to procure one which is quite as long as is desirable. It was as safe as the empty tube, and it shows well the size and position and sometimes also the shape of the stomach when empty; whereas the injection of air or fluid may considerably stretch the viscus. The method certainly enabled one to recommend an operation with the greatest confidence.

Remarks by Mr. Reid.—The technique of taking the skiagrams was as follows:—The patient is laid on his back on a canvas-topped couch underneath which the tube is mounted on a double slide which allows movement longitudinally and transversely, thus rendering it easy to centre it under any given spot. The tube is enclosed in an opaque box with an adjustable circular diaphragm placed over a 3-inch aperture opposite the anode, the smallest diaphragm being used that will include the required area. When the bismuth tube has been inserted as far as it will go, the patient is directed to hold his breath, and the exposure of from 10 to 20 seconds made, the plate being placed on the abdomen. The apparatus must be powerful to enable a sufficiently good skiagram to be taken in this time; that used in taking those shown consisted of a 10-inch variable primary coil worked off the 100-volt continuous main, with an electrolytic interrupter working at 15 ampères on the primary of the coil, and either a heavy anode or water-cooled tube.—*The Medical Press*, March 29th, 1905.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

The Twenty-eighth Ordinary Meeting was held at 11, Chandos Street, Cavendish Square, W., on Friday, March 24th, 1905, at 8.30 p.m. The President, Dr. DONALD BAYNES, in the Chair.

Present:—22 members and two visitors.

The Secretary read a letter from Dr. J. McIntyre thanking the Society for their kindness in electing him an honorary member.

Mr. Robert Donald, B.A., M.R.C.S., L.R.C.P., etc., of 75, Clyde Street, Dunedin, N.Z., was unanimously elected an ordinary member of the Society.

Mr. J. Hall-Edwards showed lantern slides of a new diaphragm compressor, and a handy holder for screens, etc., explaining their uses and advantages.

Mr. R. Donald showed some radiographs of the urinary tract of a cadaver injected with an emulsion of bismuth, in which the normal position of the ureters, etc., were clearly shown.

Mr. A. D. Reid showed a new and improved X-ray diaphragm for X-ray photography, made on the principle of the iris diaphragm, but with very thick plates, so as to efficiently cut off extraneous rays.

It was so arranged that a circle of from three inches to half an inch could be obtained by a slight movement of a lever.

Mr. J. Hall-Edwards then read his paper, entitled "The X-ray Treatment of Rodent Ulcer and Cancer," which was illustrated by lantern slides specially prepared by himself.

In the discussion which followed, Dr. HORACE MANDERS, after congratulating the lecturer on the interest excited by the practical aspect of his paper, remarked that a degree of dermatitis was an essential condition, to show that the diseased structures had been sufficiently affected. That these curative rays were evidently different in wave length or otherwise from the more penetrative rays, but whether they were actually cathode rays merely or not, could not be known until we try the Lenard rays therapeutically.

Did the lecturer use a harder tube in the treatment of deep-seated cancer?

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Dr. Manders had pushed the internal administration of fluorescin in a patient with malignant disease of omentum. There was no improvement, but directly the fluorescin was stopped improvement was marked.

Dr. G. B. BATTEN said he would like to ask if others found that a new tube was so much better therapeutically than a regulating tube, which had got too high and then been lowered.

Also whether Dr. Hall-Edwards had used formic aldehyde for the resistant corners, it was used largely and successfully for rodent ulcers. Apart from X-ray treatment the two together should be especially useful.

Dr. CODD said his experience had been that dermatitis or some definite reaction is necessary to cure. In dry non-ulcerative lupus he always used pyrogallol or other irritant ointment to produce reaction. Dosage is most important, a milliampèremeter with a valve tube or spark gap was very useful, and as many milliampères as possible should be used, and to get this result very low tubes are needed.

He had not found any difference between using a protective mask on patient's face and the lead glass tubes or screens. I use the latter generally, but where the area is too large I revert to the earlier practice of using a child's mask coated with two layers of laminated lead.

I have not had satisfactory results with Caldwell's tubes.

The SECRETARY (Dr. R. Morton) agreed with Mr. Hall-Edwards as to the altered character of the rays produced by a tube that had been in use for some time, even though the vacuum, as judged by the alternative spark gap, remained the same. Looking back on his experience with tubes, probably not less than two hundred in all, that feature stands out prominently. Both therapeutically and radiographically a new tube is more efficient than an old one, other conditions, such as size of bulb and degree of vacuum, being the same.

In those tubes with automatic regulating devices the best results seem to be obtained so long as the vacuum is never allowed to get very high, it being preferable to set the regulating device so as to keep the vacuum low, rather than to let it gradually get hard, and then bring it down with a rush, so to speak. The accuracy of this statement is difficult to prove, but it is the impression he has received as a result of past experience.

He also gave his experience with the Cossor therapeutic tubes. In the hands of his assistants at the London Hospital they were not at all satisfactory, and gave out in a very short time. In his own hands they were much less troublesome. He related the main features of a case of cancer of the cervix and broad ligaments—the diagnosis had been proved by microscopic examination—which he had had under treatment

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for the past twelve months. A Cossor tube was used throughout, and one tube with a 1-inch window lasted for about ninety applications of ten minutes each. The symptoms have improved very greatly, both subjective and objective, and the patient, who at one time was almost completely bed-ridden, is now able to go about to a certain extent, and enjoy life in a way not possible at the beginning. That this state of progression will continue seems too much to expect, but that X-ray treatment has been of great benefit there seems no reasonable doubt, since none of her advisers a year ago thought she would be alive at the present time. Owing to the improvement in the local condition a tube with a 1½-inch window can now be easily inserted in the vagina. Beyond the lead glass, of which the body of the tube is made, no steps have been taken to protect the perinacum and surrounding parts, and there has been no trace of dermatitis. Treatment is still being carried on.

Mr. R. DONALD, in commenting on the importance of paring away much of the new growth, as recommended by Mr. Hall-Edwards, mentioned that this procedure had been long used at the London Hospital by Dr. J. H. Lequeira, who, by the way, insists on the advisability of sealing up the lymph channels by the application of strong carbolic acid immediately after the paring.

The PRESIDENT felt sure he was expressing the general feeling of the meeting in congratulating Mr. Hall-Edwards on his most excellent paper The trend of the discussion and the questions asked showed that the paper was greatly appreciated, and the points raised were of importance. That the discussion would have been longer and more detailed there was no doubt, had time permitted. The cases described by Mr. Hall-Edwards were those which specially belonged to the domain of X-ray treatment. In his opinion, the therapeutic use of X-rays should be confined to diseases of a malignant or semi-malignant type, certain skin diseases as psoriasis, rodent ulcers, ringworm, and so forth. When, however, we came to the treatment of diseases curable by other means, he would hesitate to use X-rays. The effects of X-rays on the skin (which is really more of a necrosis than a dermatitis), on the glands, on the blood, and in fact on all animal tissue, were so profound, that except where nothing else would do it will be wiser to resort to other methods of treatment ; more especially was this the case when we know how irregular is the action of X-rays and how little under absolute control its effects. The many experiments that have lately been made, in reference to its action on the organs of generation, went to show that X-ray energy induced sterility both among the workers and the patients, although sexual power did not seem to be reduced. Even in cases where

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X-ray energy seemed specially applicable, he would prefer if possible using other means, as for example zinc ionization, or zinc electrolysis in rodent ulcer. Even in malignant and semi-malignant growths, Dr. Beeton Massey, of New-York, finds all he requires in metallic electrolysis (zinc mercury). Again, in pruritus ani, why risk rendering your patient sterile by curing with X-rays, when it can be done equally well and without danger by high frequency currents? He did not wish to be understood as being opposed to the use of X-rays: it had its sphere, and a very large sphere it was; all he contended was that this sphere being known, it would be wise not to go beyond it. In conclusion, he wished again to express his thanks to Mr. Hall-Edwards for his most interesting and valuable paper.

Mr. HALL-EDWARDS having thanked the members for the interesting remarks his paper had called forth, and for the kind manner in which it had been received, said: It is next to impossible for me to answer a quarter of the questions asked during the brief time at my disposal. I will, however, endeavour to deal with the most important ones. I quite agree with Dr. Donald that the application of carbolic acid or some other caustic, prior to the application of the rays, yields good results, not only by closing up the lymph spaces, but by in a degree rendering the lesions aseptic. I prefer to use tin-foil to cover my masks because it is more easily attached than lead, and experiment has proved it to be efficient. I have tried bismuth incorporated with varnishes and rubber cement, but much prefer the plaster of Paris masks, covered with tin-foil.

Hard tubes were to be preferred to soft ones in the treatment of deep-seated growth. I used such tubes in the case of cancer of the rectum I have reported. I have personally never seen a case in which a dermatitis has occurred upon the opposite side of the body to the one rayed, but I have frequently noted a marked improvement in one side of the face when treating the other. I purposely refrained from mentioning anything about the fluorescence of living tissues because it has yet to be proved that tissues under any circumstances can be made to fluoresce. From experiments I have made I am convinced that, at any rate, under the conditions so far set forth, no fluorescence of the tissues takes place, and that the published results of cases treated by this method are absolutely misleading.

I freely admit that signs of toxæmia in a case of deep-seated cancer may be, and in all probability show, that the necessary dose to bring about an effect has been given, and that a limited toxæmia in such cases is like a limited dermatitis in superficial cases. The form of toxæmia, however, to which I drew attention, was that sudden, and in nearly all

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cases severe kind, which occasionally comes on unexpectedly, and which, apparently without rhyme or reason, always brings about a fatal result.

That the X-rays frequently bring about a constitutional result, I have evidence to prove; and this quite apart from their direct influence upon the growth. It is highly possible that an X-ray bath (at such a distance from the tube that no bad effect could possibly be produced) may, by the tissue changes which may be brought about, produce beneficial effects.

One of the best methods of rendering a rodent ulcer aseptic is by means of the zinc electrode attached to the continuous current, and, moreover, small ulcers can be cured by this method, without resorting to the X-rays.

Dr. Codd has mentioned the difficulty of producing effects by means of the X-rays, in cases of non-ulcerative lupus. In such cases I prefer to set up an ulceration by other means before applying the rays.

In answer to Dr. Batten's question I may say that I have not tried formic aldehyde. I have, however, used formaline with success, but have abandoned its use for the reason that the pain produced is almost unbearable.

I am glad to note that Dr. R. Morton agrees with me that the best results can only be obtained from new tubes, and that the cost involved in the constant renewal of tubes is prohibitive.

In conclusion, I must thank our worthy President for his kindly remarks, and I only regret that the lateness of the hour prevents further discussion upon this interesting topic.

NOTICE.

Members taking part in discussions or making remarks on papers, etc., are earnestly requested to give their notes on same to the Secretary at the end of evening, so that the proceedings may be complete and not delay the prompt publication of the Journal.

THE ELECTRIC CAPACITY OF THE HUMAN BODY.—M. H. Bordier describes the principle of a new method of measuring electric capacities by means of a Rhumkorff coil and telephone. This method is applicable to the human body. In a series of experiments he has found that the electric capacity of the human body varies about the ten-thousandth of a microfarad and that it is about the same as that of an inert body having the same dimensions. The human body is not a condenser, the measurement of its electric capacity is of no use as a method of clinical investigation as it is not modified by conditions of disease. Muller thinks otherwise. W.S.H.

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MEDICAL

Electrology and Radiology.

No. 5. MAY, 1905. Vol. VI.

EDITORIAL.

It is with regret that we notice the subjoined circular which we print in full. Medical men engaged in electro-therapeutic work have had and still have to face the competition of the institute and the chemist in the field of treatment. This evil will probably remedy itself in the future when the lay public realise the disastrous results that can follow the unskilled application of such a potentially dangerous method of treatment as the employment of the X-rays. That the law in England affords no protection to the medical practitioner engaged in this as it does in the other branches of the profession is a fact that is much to be deplored. In America legislation is well on its way in some States to render it actionable for any but qualified men to undertake electrical treatment—an example that might well be followed by the Mother Country.

The action of Guy's Hospital surely raises the vexed question of unfair competition on the part of a charitable institution with the practitioner. There are many medical men who are proficient in this work and have adequate apparatus who would be glad to take patients on the terms proposed in the circular. It may be argued that the expense of a complete electrical installation and the experience required to employ it to the best advantage render it difficult or impossible for patients of moderate means to obtain efficient treatment; but excellent results can be obtained by medical men with a knowledge of the subject gained in the department of their hospital with apparatus the price of which is not prohibitive.

Moreover, if this principle is admitted it is equally logical to have surgical consultations followed if necessary by operation at an arranged fee on the plea that the furnishing of the operating theatre has cost the institution so much that some return for the money expended must be sought. In the circular it is stated that the governors are *desirous* that paying

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patients should attend only on the recommendation of a general practitioner—surely at the very least this latter clause should be made obligatory.

It is much to be hoped that the governors will find it expedient to withdraw this scheme, which though promulgated, doubtless with good intent, does not redound to the credit of an institution with such noble traditions as Guy's, and which cannot but be regarded as a reflection on a body of medical men who are no less willing to adapt their fees to suit the less fortunate of their fellow creatures than their medical or surgical colleagues.

G.H.—538. GUY'S HOSPITAL, S.E.,

January, 1905.

DEAR SIR,

You may be aware that a very completely equipped Electrical and Actinotherapeutic Department has recently been installed, where patients are treated with Finsen Light, X-rays, Radium Emanations, High Frequency Currents, Static, Faradic, and Galvanic Electricity, and Vibratory Massage, under the care of Dr. Bryant and Mr. Sichel.

It has occurred to the House-Committee that you may be desirous of availing yourself of the advantages of this Department for certain patients of moderate means, who, whilst unable to afford the necessarily high fees of Specialists, cannot be classed with ordinary hospital cases.

The fees charged are shewn in the enclosed Circular, of which further copies may be had.

The Governors, by receiving paying patients, are anxious to recoup themselves in part for the many expenses incidental to the maintenance of this large Department, in which poor cases are treated free; but they are desirous that paying patients should attend only upon the recommendation of a General Practitioner, and that their circumstances should be such as to render them deserving of treatment, which though not entirely gratuitous, is less costly than if obtained elsewhere than in a hospital.

Should you be visiting Guy's, the Governors hope that it may interest you to look into the new Department, which is to be found on the top floor of the Surgical Building, opposite Patience and Samaritan Ward.

Yours sincerely,

E. COOPER PERRY,

Superintendent.

* * *

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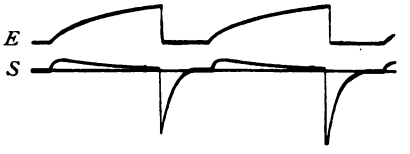
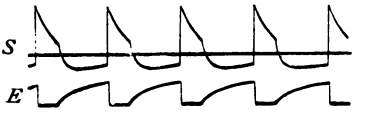
[*See Dr. Lewis Jones's paper on "Interrupted Currents," pp. 112-115.*

DESCRIPTION OF TRACINGS (*to be viewed from left to right*).

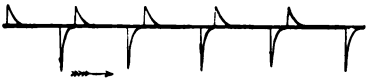
1.—Curves showing the variations of current in the exciting circuit and in the secondary circuit of a medical coil. The growth and rupture of the exciting circuit are seen above, and the corresponding currents in the secondary circuit are below.



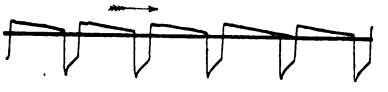
2.—The same coil with iron core inserted, showing retardation in all the waves.



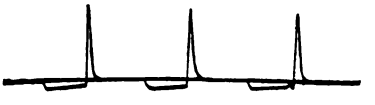
3.—The same coil with core, and rapid interruptions showing interference of the long waves of the secondary circuit.



4.—Secondary waves of a very short secondary coil, without iron.



5.—Ditto ditto with heavy iron core inserted, showing increase in length of current waves.



6.—Current waves of very short secondary coil.

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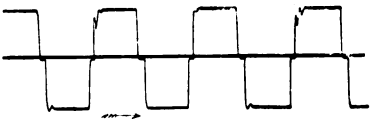
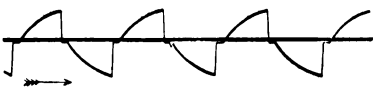
[*See Dr. Lewis Jones's paper on "Interrupted Currents," pp. 112-115.*

DESCRIPTION OF TRACINGS—*continued.*

7.—As fig. 6, but with secondary coil three times as long, showing longer duration of the wave at break.

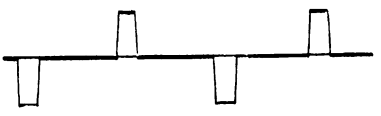


8.—Tracing of current showing interruptions and reversals in a circuit of low self-induction to show abrupt rise and fall of current.

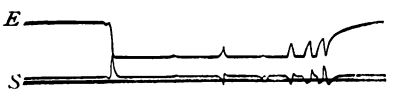


9.—Similar tracing in circuit of high self-induction.

10.—Waves of mechanically interrupted current.



11.—Interruptions and reversals mechanically produced.



12.—Irregular tracing of defective contact breaker.

S—Secondary circuit. *E*—Exciting circuit.

In 3, 6, 7 the "break" waves are above the horizontal line; in 1, 2, 4, 5 they are below.

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G.H.—524.

Entrance from St. Thomas's Street.

GUY'S HOSPITAL,
LONDON BRIDGE,

.....

Name.....

SIR OR MADAM,

In reply to your application to be received as a Paying Patient for treatment in the Actinotherapeutic Department of this Hospital I have to request you to present yourself with this letter at the Superintendent's Office on any Thursday morning not later than 11 o'clock. You will then be examined without fee by the Surgeon in Charge of the Department, and if your case appears suitable for treatment you will be informed when the sittings can be begun. Before commencing the treatment you are required to pay a sum of £6 for an Attendance Card, which will cover 24 sittings, or a less number at the discretion of the Surgeon. No part of this sum will under any circumstances be returned.

Yours truly,

E. COOPER PERRY,
Superintendent.

P.S.—It will be necessary for you to make your own arrangements to provide yourself with board and lodging outside the Hospital as no accommodation is available within the Institution.

The first Decennial Röntgen Congress was opened in Berlin on April 30th and continued till May 3rd. There was a very large and representative attendance and upwards of ninety papers were read. Next month we hope to give an account of the Congress and details of the most important papers.

RADIUMTHERAPY.—Werner and Hirschel find radium useless in the treatment of any malignant growth extending to a greater depth than 1 cm. They have, however, obtained very satisfactory results with nævus, keloid and especially lupus. In seven cases of lupus the affected parts healed perfectly and there was no recurrence after six to nine months. They do not consider the use of radium advisable in cases where the nodules lie closely together.—*Deut. Med. Woch.*, October 13th, 1904. R.H.C.

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ON INTERRUPTED CURRENTS IN MEDICAL WORK.

By H. Lewis Jones, M.A., M.D., F.R.C.P., M.R.C.S.

The important part which is played, both in diagnosis and in treatment, by interrupted currents makes the measurement of such currents very necessary, and the apparently insuperable obstacles to the measurement of the currents of the medical coil have compelled investigators to seek for some other source than the coil for furnishing interrupted currents.

The reason why medical coil measurements are unsatisfactory may be very simply stated. It is due to the fact that the various measuring instruments in use measure mean current or average current, while the physiological effects are not proportionate to the mean current, but to the character of the individual impulses or waves which compose it. Thus measurement of mean current is no guide to physiological effect unless the shapes of the individual waves are uniform and regular, and can be calculated from the mean current.

The waves of medical coil currents are not only irregular, as will be seen from the tracings shown herewith, but they differ largely from one another in the case of different makes of instrument; and they also differ at different times with the same coil if the interruptions are produced by the ordinary method of an automatic spring interrupter.

The sinusoidal current of a dynamo driven at a regular speed is capable of measurement, and the curve of its waves of current is known, and if this method of producing varying currents for medical purposes could be generally applied the measurement problem would be solved. Unfortunately a practical difficulty comes in, and that is that the commercial sinusoidal current is very painful when used in the ordinary way with small electrodes for testing, although when applied in baths and arm baths it produces sensations which are rather agreeable than otherwise.

This peculiar painful effect of the sinusoidal current is difficult to explain; we may, however, note that in general the duration of the individual waves from commercial dynamos is seldom less than 0·005 of a second.

In order to circumvent the difficulty of the measurement of medical coil currents the use of a condenser has been proposed.

In a paper which I had the honour of laying before this Society soon after its foundation I referred to the proposed use of condenser discharges for providing interrupted currents for testing and treatment.

This idea, originally proposed by Boudet, of Paris, in 1888, and by Hoorweg, of Utrecht, in 1899, has lately received fresh attention from many Continental workers, and

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at first sight the use of the discharges from a condenser of known capacity, charged to a voltage which can easily be measured, appears to go a long way towards the solution of the problem of providing an interrupted current of uniform strength.

An experimenter who would do some patient work upon actual cases with condenser discharges, especially upon cases with altered electrical reactions, could doubtless discover many new facts, and could construct a scheme of electrical testing which would be of great value, but a very considerable range of voltage would probably be required, and also a considerable battery of condensers of widely different capacities, while there would be considerable practical difficulty in overcoming the errors likely to be introduced into the problems by the great variations in skin resistance which are met with in different patients. With condenser discharges the resistance of the circuit is of the utmost importance, for it is the factor which determines both the initial magnitude of the discharge and its duration. As both of these quantities must be taken into consideration it follows that the use of condensers in testing must be complicated by the need for precise measurements of the resistance of each individual tested.

To illustrate this point we need only compare two diagrams which represent the discharge of a condenser through two resistances, one of 1,000 ohms and the other of 2,000. Both of these magnitudes are constantly met with in practical work. The differences between the curves are sufficiently striking to show how troublesome would be the calculations to determine the shape of curve for each particular resistance met with in practice.

A method sometimes employed to diminish the effects of unequal resistances in testing is to add to the circuit a further resistance, whose magnitude is so great as to swamp the range of variability which has to be dealt with: thus in the case of a human body with a resistance ranging between 1,000 and 2,000 ohms, the addition of a fresh resistance of the order of magnitude of 100,000 ohms would cause the variations met with in individual patients to sink into comparative insignificance. But if this method is tried with condenser discharges the whole curve of discharge tends to become so lengthened as to be unsuitable for diagnostic work as at present arranged.

If we now return to induction coil discharges and examine the curves of medical coils we find several points which are both interesting and new.

About eighteen months ago certain problems relating to the sensory effects of different coils were brought to my notice by Dr. Henry Head, and after various discussions in which our worthy secretary gave us the benefit of his electrical

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knowledge, the theories we had formed were put to the test by the discovery that the oscillograph of Duddell was quite able to give tracings of medical coil currents. Dr. Head in one of his expeditions to Cambridge found that an instrument there could be made use of for taking tracings and brought back several curves with him to London. I am glad to say that they verified our theoretical opinions, and since then I have made several more visits to Cambridge to secure tracings of different medical coils and of other kinds of interrupted currents.

Some of these were shown at the British Medical Association meeting at Oxford last summer, but I am glad of the opportunity of saying a little more about them to the members of this Society.

Probably all who are present here are aware of the distinctions which have been drawn between long coil and short coil secondary windings. The differences were pointed out by Duchenne, who has told us that he was the first to use a secondary winding for medical purposes. In Duchenne's time the phenomena of rapidly varying currents were not well understood, and indeed it is only within a comparatively few years that they have been recognised to be quite peculiar and different from those of continuous currents. The question of duration of induction coil discharges was neglected, at least by medical men, from a belief that their duration could be described by the word instantaneous.

As soon as it had once been realised that they were waves of quite measurable length the path of the solution of the problem was laid open. It is obvious from what is now known of the effect of self-induction in coils of wire that in long coils the growth and the decay of a current must take time. It is equally obvious that the presence of an iron core in a coil must also have an influence upon the duration of the variable period of a current wave, tending to retard the arrival at a steady state, so that we may make the following statement.

The waves of current from a secondary coil will be of greater duration when the coil has many windings than when it has few, and they will also be longer in a coil with an iron core than in a similar coil without the core.

The effect of the core is especially evident in the waves at make. These are of less general importance in testing and treatment than the waves at break, but the effect of the core upon the waves at break is also quite pronounced.

A coil with a slender iron core and short windings may give shorter waves than a coil with long windings and no core, and the longest waves are those in which the combination of long windings and a heavy iron core exist together.

When the vibrating hammer of the coil is operated by means of an auxiliary magnet arranged, as is generally done,

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in series with the primary of the coil, the self-induction of this part of the current exercises a further retarding effect, and under these conditions we get the longest waves. From such coils as these the most painful stimuli are produced, and the least painful are those in which the waves are shortest.

The length of the primary winding is also a factor, for the self-induction of a long primary will have the usual retarding effect upon the growth and decay of current.

Thus for painless muscular stimulation the best construction would be one with short windings both in primary and secondary, with no iron in the core, and with a mechanical interrupter. The frequency at which this should be driven has already been determined by Leduc as that of 100 interruptions per second, with durations for the individual waves of one-thousandth of a second and with intervals nine times as long. The good points of such a coil are not very seriously impaired by the presence of a small amount of iron in the core and figure shows discharges having just these characteristics, which I have found to be given by a form of coil designed, empirically, by myself some years ago and constructed by Mr. Schall. It is interesting to note that this form of coil has found much favour with the medical profession and is made and sold on a comparatively large scale, doubtless by reason of the agreeable character of its discharges.

The use of currents which are mechanically interrupted, to take the place of currents from induction coils, has been advocated by Leduc in a paper which has already appeared in abstract in this journal, and although the applications of these mechanically interrupted currents to testing and treatment have not yet been fully worked out, there is every reason to believe that their employment is likely to give interesting results. The ease with which the interrupter of Leduc permits of alterations being made in the duration of the impulses and of the intervals has already been described and will be found in the paper referred to. Tracings taken with this instrument are shown to illustrate the range within which they can be worked and the possibility of obtaining from them currents either simply interrupted or interrupted and reversed.

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A FATAL CASE OF CEREBRAL HÆMORRHAGE OCCURRING WHILE UNDER ELECTRICAL TREATMENT.

We have received the following notes from Dr. Ironside Bruce :—

The patient in question, Mrs. M., was admitted as an out-patient at Charing Cross Hospital on the 16th March, complaining of severe pain in the left arm and hand. The pain had troubled her for three years. There was wasting of the muscles of the affected arm but no electrical reactions of degeneration. There was a history of gout and rheumatic pains in shoulders and hands. The diagnosis made was gouty neuritis. The general health was fair and there was no sign of cardiac disease. The treatment prescribed was radiant heat baths and the patient had these baths on the 20th, 23rd, 24th, and 30th March. On the 30th the patient complained of the baths not suiting her. In consequence they were stopped and she was recommended high frequency currents. On the 3rd April the patient had high frequency current by the auto-condensation method and expressed herself two days later to her friends as feeling better both of the rheumatic pains and in general health. On the 11th April the patient came up for treatment again and she complained of nothing unusual and seemed in good condition. She lay down on the couch and the current was turned on (150 milliampères). Almost at once the patient was observed to be peculiar in appearance and the current was turned off. It was found that she was practically unconscious, and although at first there was no indication of anything more serious than fainting, there soon appeared inequality of the pupils, drawing up of the side of the face and rigidity of the limbs. In this condition the patient was admitted into the hospital and died in two hours.

The post-mortem evidence showed advanced granular disease of the kidney and a hæmorrhage from the lenticulo-striate artery into the internal capsule which had burst into the ventricle. The hæmorrhage was obviously the cause of death. The patient was under the influence of the current for a period not more than thirty seconds and the amount of the current as shown by the milliampèremeter in circuit was 150 milliampères. As a matter of routine the current is usually increased by adjustment of the spark gap, etc., to 450 milliampères, and it was on turning round to read the milliampèremeter that it was observed that the patient was peculiar in appearance. It is also worthy of note that there had been no treatment from the 3rd to the 11th of April, so that for that time the patient had not been subjected to the effects of the treatment, and moreover she had expressed herself as feeling better during that period.

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THE TREATMENT OF TINEA TONSURANS BY THE X-RAYS.

SABOURAUD ET NOIRÉ (*Ann. d'Électrobiol. et de Radiol.*, No. 1, 1905).

The value of X-rays in the treatment of ringworm of the scalp has now been established. By means of them not only can the disease be successfully treated, but the time occupied in the treatment of the average case can be reduced to about one-quarter of that taken by any other method.

In 1896, one year after Röntgen's discovery, Freund attempted radio-therapeutic treatment of ringworm amongst other skin diseases, without definite result.

In 1900 Schiff stated at the Paris Congress that radio-therapy was to be the treatment of the future for ringworm and favus. Since then a number of incomplete experiments have been made. But the absence of instruments for measuring the rays employed, and the accidents which have been the consequence of this have made the experimenters very timorous, and therefore, for the most part, an interminable number of exposures have been given (forty in a single case) and that alone made the treatment of no practical value. A simple and practical method has now been devised by Sabouraud. The technique is as follows:

The tube is excited by two motor-driven static machines, a regulating tube is used, the spark gap being kept at 10 cm. The tube is enclosed in a metal case having an opening towards the patient's head for the passage of the rays; into this cylinders of varying diameter (according to the size of the patch treated) are fitted, the length of these cylinders being so arranged that the patient's head is 15 cm. from the anode.

The one thing still wanting is a method of measuring the quantity of rays given off by the tube in a given time. This is effected by the use of the "Radiometer X" of Sabouraud and Noiré. It consists of paper coated with an emulsion of barium platinocyanide in a collodion of amyl acetate; this changes colour under the action of X-rays. It was then easy to obtain a standard water-colour tint, and when the pastille reached this tint, sufficient rays had been used to produce total depilation without causing an erythema. The colour is the "teinte B" of Sabouraud's and Noiré's radiometer and corresponds to 5H of Holzknecht. The drawbacks to it are that:

1. The pastille bleaches rapidly when exposed to daylight and must therefore be wrapped in black paper, and moreover when it is desired to look at the colour in daylight it must be done quickly.

2. These pastilles are less sensitive than those of Holzknecht and must be placed only 8 cm. from the anti-

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cathode (*i.e.* half-way between the anode and the skin of the patient).

3. The pastille must be placed on a metallic surface which is impermeable to the X-rays.

As long as the pastille does not pass the "teinte B" there is no danger even if the exposure is long, it only proves that the source of the rays is feeble.

A scalp which has been thus treated shows nothing till the seventh day, when a slight, scarcely visible, erythema appears, which passes four days later into a faint pigmentation; from the fifteenth day hairs begin to fall out all over the area treated and the defluvium is complete in a few days, the hairs coming out without being pulled. The X-rays are not parasiticides, at any rate under the above conditions, and if cultures are made from the fallen hairs even the last invariably give positive results. The regrowth is slow; this apparent drawback to the method is one of the reasons of its success, the last infected hair falling out a long time before the new hairs grow. The new growth is visible two months after the operation and is complete three months later.

With reference to the quality of rays to be employed, M. Sabouraud's opinion differs somewhat from that of most English observers. He says, "Much has already been written on the differing penetration of the different categories of X-rays without, as far as I know, saying what is of greatest import in practice. The most important point is that the more penetrating the rays produced the more rays are produced—at least with the static machine. In practice one may reckon that the penetration of the rays is proportionate to their number.

"With the static machine, when rays are produced registering 8°—11° on Benoist's radiochromometer, rays are at the same time produced, which, if isolated, would register 1°, 2°, 3° 4°, 5°, 6° and 7°. Thus, what must be borne in mind is that the danger of the X-rays is proportional to their penetration, because the more they are penetrating the more are they numerous. What one learns from this is that it is more dangerous to operate with rays registering 8° to 11° than with those of 3° to 5°; this is vital and must never be forgotten. As a corollary it may also be said that the more penetrating the rays used the more rapidly will the therapeutic effects be obtained, and now that we have with the radiometer X an accurate means of verifying what we are doing, there is a great advantage in using penetrating, rays because by their use the necessary exposures become much shorter. As to the effect to be obtained (*i.e.*, in this case depilation) experience shows that it is produced both by rays registering 3° and those registering 11°; or in other words that all qualities of X-rays produce it." R.H.C.

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DIGEST OF CURRENT AMERICAN LITERATURE.

ELECTRICITY.—In a paper upon "Recent Advances in Electrotherapeutics" Morton refers to the great and almost revolutionary advance recently attained by leaps and bounds, so to speak, in the domain of physics. He notes in the same connection the importance of general physics to the medical man which holds its own fairly with the special physics of chemistry. The trend of the new order of thought in modern physics is briefly reviewed, and the relation of the same to electrotherapeutics elucidated. The new order of facts relating to radiations are tabulated as follows :—

RAYS.	SOURCES.	THERAPEUTIC EFFECTS.
Herzian waves.	Electro-static.	Physiological.
Dark heat and X-rays.	Heated substances, etc.	Physiological.
Radiant heat.	Incandescence, etc.	Physiological and inflammatory.
Visible spectrum.	Arc lamps.	Physiological and inflammatory.
Ultra-violet.	Arc lamp.	Bactericidal, etc.
Alpha (emanations) Beta (corpuscles) Gamma (ether pulses)	Radium.	Chemical, physiological, bactericidal, inflammatory, electroscopic, photographic.
Cathode rays.	Crookes's tube.	Chemical.
X-rays.	Crookes's tube.	Chemical, electroscopic, bactericidal, inflammatory, photographic.

The application of these radiations in medicine constitutes the new electrotherapeutics. In passing, Morton very wisely calls attention to the fact that there exists not only a danger but a tendency to confuse a brush discharge with a true high frequency discharge. The tendency to sacrifice the true physiological effects of the real high frequency potential currents to the more spectacular effluve or brush discharge is commented upon. The Röntgen ray, radium, artificial fluorescence of living tissue and the production of anæsthesia by electricity alone, as demonstrated by Dr. Stéphanie Leduc, of Nantes (France), are all reviewed and assigned the places accorded them by the writer.—*New York Med. Journ.* and *Phila. Med. Journ.*, April 11th, 1905.

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ELECTRICITY IN OTOLOGY.—Dr. J. J. Richardson, in an article on the above subject, states that electrical energy in its various forms has not been employed in the diagnosis and treatment of aural affections to the same extent that it has been in those of other regions of the body, and finds that the subject has been practically ignored by some of the best writers on otology. While not an enthusiast claiming that electricity is a panacea for all diseases, careful experimentation and observation have been convinced that it possesses at least great possibilities along certain lines. The more he employs it the more he is convinced that great

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benefit may result in the future from its scientific use. From practical experience he finds that by its employment in one form or another (1) weak muscles can be stimulated, (2) pain relieved either by the direct action of the current or by the cataphoric application of anæsthetics, (3) absorption of inflammatory exudates stimulated, (4) stenosis or complete strictures overcome, (5) nervous activity renewed. The need of apparatus of high standard and instruments of precise control are insisted upon as well as careful differential diagnosis upon which the therapeutic indication depends, polar indications must be met and great care used in the manner of expending and the amount of electrical energy expended. The detailed technique given is good, and also the reasons for the use of continuous (galvanic) and the magnetic induced (faradic) currents. For the relief of tinnitus he finds electricity of avail where other forms of treatment have been of no avail. In tinnitus of labarynthric origin, due to chronic inflammatory changes in the middle ear, he finds the continuous current, one to three milliampères from six to ten minutes, of the greatest benefit.—*New York Med. Journ.* and *Phila. Med. Journ.*, February 25th, 1905.

Remark.—A very considerable clinical experience with this class of cases in which electricity has been used is confirmatory of Richardson's work.

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The "ARCHIVES OF PHYSIOLOGICAL THERAPY."—Since the advent of the *Journal of Physical Therapeutics* in October, 1900, now *Medical Electrology and Radiology*, numerous journals have sprung up devoted to the same subject. The latest comer is the *Archives of Physiological Therapy*, edited by Dr. C. E. Skinner of Newhaven, Conn., and published by Richard G. Badger, of Boston. It is a triumph of the publishers' art from cover to cover, and commends itself over and above most medical journals in the very limited space devoted to advertisements. The collaborators are for the most part well-known men, and the initial or February number contains the International Electrical Congress paper of Professor Maurice Benedikt, of Vienna, upon "The Radio-diagnosis of Diseases of the Head and Brain," and also the Congress paper of Dr. Wm. J. Herdman upon "Dupuytren's Contraction with Indications as to Treatment." Kellogg contributes a paper upon "Phototherapy in Chronic Diseases," and Dr. W. H. White one upon "High Frequency Currents and their Action," both of which were read before the American Electrotherapeutic Association at its fourteenth annual meeting. The digest of the current literature of physical methods consist of well chosen extracts from the special journals. If the editor and the publishers keep the pace they have set the *Journal of Physiological Therapy* will soon make for itself a permanent place in medical literature.

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DUPUYTREN'S CONTRACTIONS WITH INDICATIONS FOR TREATMENT.—Herdman in his admirable paper reviews the statistics of this condition, the normal anatomy, pathological anatomy, the

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matter of diagnosis, of etiology, and last, that of treatment. In addition to general treatment for the purpose of counteracting a gouty or rheumatic condition and of building up, *i.e.*, of general stimulating, toning and transforming action, the high tension forms of electrical energy seem best adapted, and it matters little whether these be obtained from the static machine, the Ruhmkoff or the Tesla coil, or from the self-induction in the alternating magnetic field after the method of d'Arsonval and others, the general application of the continuous current or the "general galvanism" of the older workers in this field answers the same purpose, but is much less convenient of application and believed by Herdman to be slower in its action. For the local lesion surgical intervention with its additional scarring is not advisable, but in the direct electric current of suitable strength the writer finds a series of effects which seems to him most admirably adapted to meet the tendency to cicatricial contractions in fibrous tissue. The value of supplementary or accessory measures for the benefit of both constitutional and local state, such as diet, hot baths, oily embrocations, massage, and probably in some cases properly adjusted splints with the view of maintaining moderate contracting tension upon the constricting bands, while recognised, are not regarded as curative.—*Archives of Physiological Therapy*, February, 1905.

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X-RAYS AND STERILITY.—Drs. F. Tilden Brown and Albert T. Osgood present the results of their observation in an article with the above title. Their first report was based upon the fact that ten X-ray workers who had consulted them were the subjects of total ozoospermia, although none of them has suffered from any venereal disease or tranmatism involving the genital tract, none of them presented signs of abnormality of these organs and none was conscious of or gave a history of functional derangement. Since the first report the number of cases has increased, and they now have records of eighteen cases in whom total ozoospermia or oligo-necrospermia has been demonstrated. More than three who have done extensive X-ray work for several years show no spermatozoa in their seminal fluid, while a few of the men who have been engaged in the work for a shorter time and have exercised care in avoiding direct exposure to the active tube, show varying states of oligo-necrospermia. The experimental work of Albers-Schenberg, Frieben, Bergonie and Tritondean, and Philipp are referred to, and a case of pruritus ani reported by Dr. Bolislad. Lapowski quoted in detail in which two treatments established a necrospermia. After twenty-five days' rest two more exposures ten to fifteen minutes were given, subsequently complete ozoospermia was established. After five months' abstinence from examination of the seminal fluid revealed living spermatozoa in large numbers. The authors insist upon careful screening of the operator, assistants, patients, etc., and gives the following warning: Repeated prolonged exposure of the testes does produce sterility in the human being. All parts of the body not exposed for examination or treatment should invariably be protected.—*Amer. Journ. of Surgery*, April, 1905. THE AMERICAN EDITOR.

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NOTICES OF BOOKS.

THE EFFECTS OF TROPICAL LIGHT ON WHITE MEN. By Major Chas. E. Woodruff, A.M., M.D., surgeon United States Army. New York: Rebman Company; London: Rebman, Ltd., 1905.

This is a very instructive and readable book and one which will serve to stimulate study along comparatively new lines. The influence of light upon life and the relation of light to life is as old as the sun, but the riddle is not yet fully read. If every army physician used his powers of observing and recording facts as carefully as Major Woodruff has done the gain to science would be very great. Woodruff was stimulated to a study of the influence of tropical light upon white men by the theory advanced by Von Schonuedel that skin pigmentation was evolved in man for the purpose of excluding the short and high frequency vibrations of light energy so destructive of living protoplasm. This theory of nigrescence and pigmentation, according to Woodruff, shows why blond types prevail in cloudy countries and brunettes in the southern and tropical countries ablaze with chemically active light. There is no question in the reviewer's mind but that skin pigmentation must be regarded as an organ of defence. Given the same quality of brain the coloniser of tropical countries provided with this opaque armour is the one who will succeed. By this theory Woodruff accounts for the fact that the white or unarmoured man, so to speak, is a poor coloniser of tropical regions although a successful director of such tropical colonies. Especially of great interest are the chapters upon "The Blondness of Aryans," "Evolution of Blondness," "The Results of Insufficient Pigmentation," and "The Results of Migration of Blond Races." The book abounds with authoritative references and quotations in support of the theory advanced. They are for the most part very convincing, some of them apparently conclusive. On the other hand exceptions may be taken to some of the broad generalisations. The results of insufficient pigmentation Woodruff finds many and injurious, varying in the white man stationed in the tropics from a tropical light. Stimulation to a tropical light exhaustion as evidenced by the apepsia, neurasthenia, insanity and amnesia, characteristic of tropical light exhaustion. It does not follow, however, that light is prejudicial to health as exhibited in the more northern countries, nor that the sun is to be regarded as the arch enemy of man. The more intense the light the greater the chemical energy, but happily for man in the temperate zones this intense chemical energy does not reach the earth in sufficient quantities to do harm. The lesson to be drawn from the pages of Major Woodruff's book is not that sunlight is prejudicial but that the intense light of tropical countries is to be avoided by the unpigmented white man. To the end of minimising its untoward influence of excessive light in tropical countries, practical rules for white men stationed therein are laid down in the final chapter covering every point of hygiene. These should prove invaluable to the army and navy as well as to the commercial resident and the tourist. M.A.C.

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KONSTRUKTION UND HANDHABUNG ELEKTROMEDIZINISCHER APPARATE. By J. Zacharias and M. Müsch. 8vo. pp. 292, with 209 illustrations. Published by J. A. Barth, in Leipzig. 8/- unbound, 9/- bound.

Many medical men who have occasion to use electrical apparatus find a difficulty in understanding its internal mechanism. For such this book must be of great interest. It contains a lucid description of every kind of electrical instrument which has applications in medicine and surgery, with instructions for its use. Clear diagrams are given of the internal mechanism, as well as of the finished appearance of each instrument. R.H.C.

NOTES AND ABSTRACTS.

Tuberculous Adenitis treated by X-rays.—Dr. Bullit has been able to collect 226 cases. Of these, 79, or 35 per cent., were cured; 92, or 40 per cent., improved; and 55, or 25 per cent., unimproved. These results obtained with the faulty technique of former days compare very favourably with the results obtained by other methods of treatment. The author reports a few cases which illustrate the value of the ray treatment. In the case of a young woman, exposures were made three times in the week, using a high vacuum tube at a distance of 15 inches, and with a current of four ampères passing through the primary. The glands began to reduce in a fortnight, and at the end of seven weeks had almost disappeared. At the same time râles in the right apex disappeared, and her general health improved. In another case a gland had broken down, and the resulting abscess was incised. As the result a sinus formed. Under treatment, twice weekly for fifteen minutes at a time, the sinus healed up in a fortnight, while the other enlarged glands diminished to half their former size with ten exposures in seven weeks.—*Ed. Med. Journ.*, April, 1905.

Bergonie also reports four cases in which careful observations were made as to quality and quantity of the rays employed. He finds the greatest benefit to be obtained when using those rays which either by their quality or their quantity produce a violent inflammation of the skin. Some of the affected glands in these cases were, as a control, protected from the action of the rays, with the result that they remained unchanged, while the glands that were undergoing treatment became rapidly smaller, and tenderness and infiltration disappeared. All four of these cases were non-suppurating.—*Arch. d'Elect. Méd.*, April 25th, 1905.

R.H.C.

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Photographic Records of N-rays.—Blondlot gives an account of tests intended to place the action of N-rays on an electric spark beyond any doubt. They refer to the arrangement in which a photographic plate is exposed to the action of an electric spark containing N-rays, with or without the interposition of a lead screen. The objection that the screen itself might, by its capacity, increase the brightness of the spark is effectively disposed of by eliminating the N-rays by means of a moist paper screen and showing that then the introduction of the lead screen produces no effect on the photographic record. The more serious objection that the time of exposure might not be quite the same with and without the rays, and might be unconsciously made in favour of a positive result, is met as follows: A chronograph is employed to give time signals and to register the times of exposure. The operator counts twenty-five seconds for each exposure and exposes alternately with and without the rays. The greater impression is invariably associated with the presence of the rays, and the chronograph records show that the exposures are equal to within half a second. For further security the author then made a practice of always counting an extra second in the absence of the rays. The superiority of the impression in the presence of the rays was still well marked, and the chronograph records showed that the exposure without the rays had been one-half to one-third of a second longer. A similar result is obtained by making two exposures of fifty seconds each. The author claims that these photographic records are the unexceptionable evidence of the existence of the rays.—*Comptes Rendus*, November 21st, 1904.

R.H.C.

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TREATMENT OF TINNITUS AURIUM BY HIGH FREQUENCY CURRENTS.—Great benefit has been obtained by Imbert in a number of cases. He uses a glass electrode attached to an Oudin resonator. This is applied direct to the region of the ear affected and as much current used as the patient can comfortably endure. Three applications weekly are given, lasting from three to six minutes. The treatment has always proved effectual in cases unaccompanied by suppuration. When the tinnitus is not very chronic or intense, improvement is noticed after the fifth or sixth application. This improvement is not always continuously progressive, frequently it is interrupted by relapses, which are, however, evanescent. It seems necessary not to interrupt the treatment as soon as the complete disappearance of the symptoms is obtained, but to continue it for at least a month. Imbert has never observed an increase in the power of hearing when that was diminished. (*Journ. de Physiothér.*, February 15th, 1905.) R.H.C.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by REGINALD MORTON, M.D., *Secretary.*

The Twenty-ninth Ordinary Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on Thursday, April 27th, 1905, at 8.30 p.m. The President, Dr. DONALD BAYNES, in the Chair.

There were present 15 members and one visitor.

The minutes of the previous meeting were read and confirmed.

Dr. H. LEWIS JONES read a paper on "Oscillograph Tracings of Induction Coil Discharges and other Interrupted Currents," which was illustrated by lantern slides, and appears elsewhere in this issue.

In the discussion which followed :—

Mr. CLARENCE WRIGHT expressed great interest in the points brought forward in this very suggestive paper, and congratulated the author on the good use made of one of the latest instruments of precision. The interpretation of oscillograms—considered as graphic records of the wave form of currents—was by no means easy, allowance had to be made for the Time, the Arc, and the Cam, error. Mathematical considerations constrained one to believe that the character of the induced currents, *i.e.*, their wave form, direction and duration, was to an extent determined by the intensity of the magnetic field and the rapidity of its variation, as well as by the relative amount of self-induction in the two circuits. Magnetic inertia, by opposing the rapidity of variation in the intensity of the magnetic field at "make" and increasing it at "break," influenced the duration of the induced currents. The nature of the core, *i.e.*, the presence or absence of iron also affected the oscillation period. Self-induction in the secondary circuit, by opposing too rapid demagnetisation, protracted the duration of the induced current at "break,"

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and reduced it at "make." The amount of self-induction in the primary circuit was even of greater moment, it determined both the intensity of the magnetic field created by the current during the latent period and that of the extra current at break. As the "extra current" was invariably generated quarter of a period after the geometrical rupture, it tended, unless properly arranged for, to convert the spark that passed between the contact studs of the interrupter at "break" into an arc, such arcing was calculated to reduce the intensity of current induced in the secondary circuit at "break" and also to affect its duration.

Dr. T. D. SAVILL congratulated Dr. Jones upon his valuable communication, which must constitute a most important advance in electrical testing and dosage, and would reduce them to more scientific methods. He seconded the proposal of the previous speaker that the paper and tracings should, if possible, be printed in the body of the Journal of the Society. Dr. Savill asked if any experiments had revealed the influence which the passage of a constant current through the secondary coil had upon the shape and duration of the various curves.

Dr. R. MORTON considered that the most important practical conclusion to be drawn from Dr. Lewis Jones's most interesting paper was that by means of suitable commutators all the advantages of the induction coil could be obtained without its disadvantages, which are many. While as an electrical appliance for both testing and treatment, the induction coil will be always popular on account of its cheapness and simplicity, yet from a strictly scientific point of view it is a very crude instrument, chiefly from the fact that it is impossible to build coils to give exactly similiar output or to reproduce any given set of conditions at will. With a properly constructed motor-driven commutator, any set of conditions can be reproduced at will, and by putting a milliampèremeter between the commutator and the source of supply the current is accurately measured before being affected by the commutator. He has had these in use both privately and at the London Hospital, and the current so obtained is particularly pleasing when testing, which is a great comfort when dealing with children. By driving at a high speed so as to give about 400 reversals per second, and to so set the brushes that that the impulses are very short, with a comparatively long interval between each, a muscle can be caused to contract strongly without any sensation of pain.

He was of the opinion that for some purposes mechanically interrupted and renewed currents would displace the induction coil for many purposes.

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Dr. W. F. SOMERVILLE then read a paper on "High Frequency in Insomnia."

Mr. President and Gentlemen,—We have had on various occasions papers read before this Society which illustrated the benefits derived from the application of electricity in various forms of disease, such as skin affections, rheumatoid arthritis, constipation, etc., but, so far as I am aware, the beneficial influence of electricity on the very prevalent complaint of *insomnia* has never been discussed by us.

Insomnia is a result more of city than of country life and it seems to be ever increasing. I fancy it is a trouble with which our forefathers were little acquainted, but in the present day with the rush and bustle in the daily life of the professional man, of the merchant, the student and the "society lady" we, as doctors, are frequently called upon to prescribe for sleeplessness. Now, I have no hesitation in saying, after over twenty years of general practice, that, quite without the use of drugs, we have at our hand a most excellent means, not only of calming the nerves of our overtaxed patients, but also of giving them a refreshing and dreamless sleep. I refer to the use of the high frequency currents. It is not to be supposed that electricity immediately after a single application is competent to produce a ready and prolonged sleep as we are accustomed to experience after sulphonal, trional and other hypnotics have been administered, nor can we hope for electricity to obliterate pain, as we know that opium and its preparations are capable of doing, but after abundant use of high frequency currents during a period of nearly three years, I have every confidence in asserting that following a course of treatment varying from twelve to fifty applications, it is possible to give relief emphatically and permanently to a sufferer from sleeplessness. Further, though we lack in electricity the immediate benefit which follows the administration of one of the ordinary hypnotics, yet by way of compensation we can produce sleep without any deleterious effects. It is well known that hypnotics to produce habitual sleep have to be continually prescribed, sometimes in increasing doses, and further that no hypnotic can be taken for any length of time without giving rise to unpleasant consequences. By electricity, on the other hand, the sleep that is produced resembles that of childhood, and it is unaccompanied by any headache, disturbance of digestion, constipation or nervousness, all of which symptoms we are accustomed to meet with in those for whom the usual sleep-producing drugs have been prescribed. The sleep which electricity gives rise to is not only sound but decidedly refreshing, and still further, not only do the high frequency currents induce sleep, but, as we who employ this form of electricity are well aware, they improve the tone of the system

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to such an extent, that our patients are better fitted to resist and to overcome the evil influence of professional, business, educational or domestic cares and anxieties.

The explanation of the influence of high frequency currents in producing sleep in the human subject I am not prepared to state, indeed I question if any of us can give a satisfactory reason how these currents exercise their hypnotic properties. Still, when we remember that the high frequency currents act on the vaso-motor system and give rise by inhibition to dilatation of the blood vessels throughout the body, a condition clearly manifested in the sensation of warmth experienced for several hours in the extremities and on the surface of the body generally, one is led to conclude that a corresponding anæmia of brain is caused which may produce sleep.

I may now refer to my own experience in the treatment of insomnia. While comparatively few patients have sought my assistance suffering purely from sleeplessness, a great many who have come to me for treatment for various diseases have mentioned that sleeplessness was a prominent feature of their case. I think I may safely say that in two cases only have I met with complete failure; all the others have benefited to a greater or less degree, though in the earlier part of this paper I contrasted the suddenness of the effect of a dose of trional with electricity in respect to the prompt action of the drug, yet I am frequently told by patients who present themselves for high frequency treatment, suffering from various ailments, that after the first visit they have been so overcome with sleep that they have had to lie down for one or two hours in the afternoon. The more severe cases of insomnia, however, do not as a rule respond till they have had about three weeks' daily treatment.

One explanation I may give why I failed in the two cases above referred to. At that time I possessed an apparatus which was capable of giving an output of only 300 milliampères. Since I have employed M. Gaiffe's new high frequency installation, with which I can obtain a greatly increased output, much better results have been attained.

By way of illustrating what I have already said, let me offer you a few notes of four cases. The first of these is myself. Three years ago I suffered considerably from sleeplessness, and even during my summer holiday I awoke so early in the morning that I was in the habit, in order to overcome my restlessness, of going out fishing even before the early worm had appeared, nor could I obtain the usual afternoon nap that one enjoys in holiday time, after an early dinner. No sooner, however, did I commence dealing with the high frequency currents in September, than sleep returned to me, and I learned to fully appreciate, possibly for

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the first time, the blessing of a good night's rest. Since then sleep and I are well acquainted; indeed the union is now so profound that the night bell has ceased to disturb it, and I rise in the morning thoroughly refreshed.

The second case is that of a medical friend who has kindly furnished me with notes of his case, and these by his permission I now give to you.

"From the middle of July of last year until well on into January of the present one, it was my misfortune to be subjected to certain very painful experiences which caused me acute mental distress, and so haunted my thoughts, that it was with great difficulty that I attended to my professional work. By the beginning of September I was troubled with insomnia. I almost invariably lay awake until 5 or 5.30 a.m., when I fell into a troubled dose from which I awoke at 6, 6.30 or at latest 7 a.m.

In spite of this state of matters I would not take any hypnotic; and I consequently began to feel very exhausted and unfit for work. A crisis, however, was reached in January of this year, when for more than seventy consecutive hours I was unable to get sleep for even a single minute. At the end of that period I felt as though my reason would give way, and it was with almost superhuman effort that I compelled myself to go through the routine of my daily duties. In addition to the feeling of exhaustion I had a severe pain in the vertical region of the head, and it was with difficulty that I could concentrate my thoughts upon any subject. I well remember that it was on the third day after the insomnia had become absolute, that I happened to meet you and to mention to you the deplorable condition in which I found myself. You urged me to try the effect of the electrical treatment, and to this course I gladly consented. That same day I had my first *séance*. I had then made up my mind to use trional, but at your request abstained from taking any hypnotic whatsoever. On the night after my first sitting I slept for about half-an-hour, and felt a distinct diminution in the nervous tension from which I suffered. The sittings were continued daily for a time. On the second night I slept for over an hour. By the third night I had three hours of sleep, and the agonising vertical pain had practically disappeared. Very rapidly my period of sleep became extended, until at the end of a week or ten days I was able to get every night from six to seven hours of refreshing sleep. Besides the return of sleep, however, I experienced a feeling of well-being that was indescribably enjoyable; and my capacity for, and enjoyment in, my work returned to the fullest extent. Altogether I had some thirty sittings, and from the third or fourth of these up till now (five weeks since they were discontinued) I have slept soundly and have been in excellent health and mentally vigorous.

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On one occasion, about ten days ago, I had a sleepless night, but a special circumstance was to my mind quite accountable for the occurrence, and I have had no return of the condition.

Post hoc propter hoc is a conclusion to which we are often very apt to come in error; but I am convinced that in my case the connection between the treatment and the improved condition (I should rather say the absolutely cured condition) is too marked to allow of any doubt as to the effect being the result of the only cause. I cannot be too grateful for the benefit I have received at your hands."

The third case is that of a lady of 40 years of age, the widow of a doctor. She was sent to me by Dr. Alex. Thomson of Glasgow, in September, 1904, suffering from alopecia areata of three months' duration. She was a very nervous lady and suffered from pronounced insommia, which was only overcome by means of very frequent doses of bromide of potassium. I may mention in passing that after receiving about fifty applications of high frequency, both generally and locally, the alopecia was found to have disappeared, and strong hair which, however, at first was pure white, was noticed growing from the bald patches. Since then, the new hair is becoming black like the rest of her hair. But what I wish now particularly to note is, that the insomnia to which she was such a martyr has completely gone. I met her a fortnight ago four months after treatment was discontinued, when I was delighted to learn that notwithstanding bereavement and domestic troubles, she was still enjoying excellent sleep at nights.

A fourth case I may now describe to you which illustrates the value of combining Weir-Mitchell treatment, including isolation, feeding and massage with high frequency.

The patient, a married lady of about 40 years of age, was sent to me by Dr. Crawford Renton, in August, 1904. Ten years ago she began to suffer from sleeplessness produced, as she told me, by "boredom." She was unfortunately at that time advised to try the effects of stimulants, which produced such disastrous results that she had to undergo a special course of treatment. For a period of three years she kept all right, but on the return of her insomnia she was again led to seek consolation in stimulants. The state of the lady now became worse than ever. Her intemperance developed to such an extent, that for a period of two years previous to my seeing her, she was in the habit of imbibing 24 ozs. of whisky daily. The statement is almost incredible, and indeed perhaps it would be wise to accept it with a reservation. At anyrate she was brought to my neurasthenic home in a condition of collapse bordering on coma; the heart's action was feeble and irregular; digestion was seriously impaired, and altogether she was a miserable wreck. The greatest care and attention

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were required, and a nurse was constantly in attendance lest the acute depression from which she suffered might give rise to unpleasant results. Strychnine was administered hypodermically at suitable intervals, both during the day and at night. Stimulants had at first to be permitted, but they were very rapidly diminished, and for a night or two trional had to be administered. The heart's action was so irregular and feeble that it was not deemed advisable at first to permit the patient to come downstairs for electrical treatment, but on the fifth day after admission electrical treatment was commenced and the trional was discontinued. The high frequency currents had an almost immediate effect in producing sleep, and each morning the patient wakened much more refreshed than she had been accustomed to do after her dose of trional. As the pulse soon began to improve, the strychnine was discontinued on the ninth day after admission, and meanwhile abundant nourishment was administered. Progress from this time was uninterrupted; the feeble state of the muscular system was immensely improved by means of suitable medical exercises, and the general health was maintained by giving her occasional drives in an open carriage and afterwards making her take daily walking exercise out of doors. After in all a month's treatment the patient was dismissed, having gained a stone in weight, and having acquired the habit of sleeping all night through. The desire for stimulants no longer pressed upon her; her pulse had resumed its proper vigour and tone, and she left the "home" a different woman, both morally and physically. During the past winter I have received the gratifying intelligence from her husband that this lady maintains the good position produced by the treatment, so that the cure gives promise of being lasting and even permanent.

I would again like to draw attention to this case as illustrating the great importance of a combination of beneficial influences, where the nervous system gives evidence of being seriously impaired. The good result exhibited by the case was due to the association of high frequency currents with the influence of the Weir-Mitchell discipline, and this accords with other experiences of the same order. I should like to emphasise the point that the joint employment of these therapeutic agencies has a value in excess of what may be claimed either for one or the other taken separately.

It is unnecessary, I think, to adduce further instances to strengthen my statement that in the high frequency currents we have an agent which is capable of producing sleep in its most refreshing form, and is effective in counteracting the ravages that are occasioned by intemperance whether in work, in study, in gaiety, or in stimulants.

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Before concluding this paper I should add that the method of treatment which I usually adopt in cases of insomnia is chiefly that of the condenser couch, and I find that much better results are obtained when in the case of adult females, a minimum of 200 milliampères and a maximum of 700 are passed through the patient. In the case of men, I commence with 400 and rise to 850 milliampères. I have never yet seen any evil effects from these large doses either in men or women, but the dose is always increased gradually. Occasionally the brush effleuve is employed over the head and back, and in obstinate cases I have found benefit from massaging directly over the back, the patient being connected with one of the terminals, while the current from the other terminal passes through the operator. This may be varied by laying the hand and forearm on the patient's back from the nape of the neck downwards over the spine. In this direct form of massage about 400 milliampères may conveniently be employed. Used in this fashion I can confidently commend to my confrères the application of the high frequency currents as a valuable agent in the relief and permanent cure of insomnia.

After a few brief remarks by Dr. HORACE MANDERS and the PRESIDENT, the meeting adjourned.

NOTICE.

Members taking part in discussions or making remarks on papers, etc., are earnestly requested to give their notes on same to the Secretary at the end of evening, so that the proceedings may be complete and not delay the prompt publication of the Journal.

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MEDICAL

Electrology and Radiology.

No. 6. JUNE, 1905. Vol. VI.

EDITORIAL.

In the early days of X-ray photography the objection was mooted that the utility of this method would be limited inasmuch as the lesions which could be demonstrated were only those of a gross nature and such as were readily recognisable by any competent surgeon. Of many X-ray photographs this is still true, but with improved technique details of bony structure can be made out, which were not before apparent without actual section of the bone. In this category fall such injuries as linear fractures without displacement and rarefaction of the osseous structures. Bone, containing as it does in itself the elements of its own destruction and reconstitution, is able in spite of its rigid nature to adapt itself to its environment. The absorption of bone by a tumour is due not to the cells of the tumour but to the cells of the normal part of the affected bone and in suppurative processes the same is probably true : a piece of dead bone may be for years in a suppurating cavity without becoming absorbed. The factors, however, which determine the absorption of bone are by no means entirely worked out.

If a long series of posterior nerve roots, *e.g.* second cervical to fifth dorsal, are divided, the corresponding limb rapidly becomes paralysed, but the bones undergo no change. If, however, instead of dividing the nerve roots they are ligatured, producing not a clean section but an irritant lesion, a different chain of phenomena ensues. The bones become rarefied and can be fractured by any trivial force. It would seem that it is not necessary to irritate the posterior roots

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but that irritation of the periphery of an afferent nerve has a similar effect. In tubercular disease of the foot, starting in the commonest situation round the base of the first metatassal, rarefaction as a result of the disease occurs in the affected bones, but the whole of the rest of the tarsus and even the malleoli share in this rarefaction, although they contain no tubercles, and an operation devised to remove the whole of the rarefied bone would be much more extensive than would be necessary for the cure of the patient. We must therefore be on our guard in giving an opinion as to the extent of the disease from the skiagram alone. A similar phenomenon is also observed after bony injuries, for example, the well-known absorption of the distal side of the neck in intracapsular fracture of the femur. In osteo-arthritis this rarefaction is very marked. This disease is one whose etiology is obscure, some authorities considering that it is trophic in nature and the real source of the disease is to be sought in the nervous system, and others that it is of the nature of a chronic infection or with a modification of the ordinary pyogenic organism introduced from the alimentary canal, or from oral sepsis. In either case we are probably dealing with an irritant lesion of the afferent nervous channels leading to absorption. In locomotor ataxia the lightning pains and visceral crises are evidence that we are dealing with an irritant lesion of the afferent neuron, and here more than in any other disease rarefaction of the bone takes place to such an extent that spontaneous fractures are extremely common. The ease with which these osteoporotic changes can be demonstrated by careful skiagraphy should lead to more light being thrown on its incidence and etiology, and affords a fertile field for investigation.

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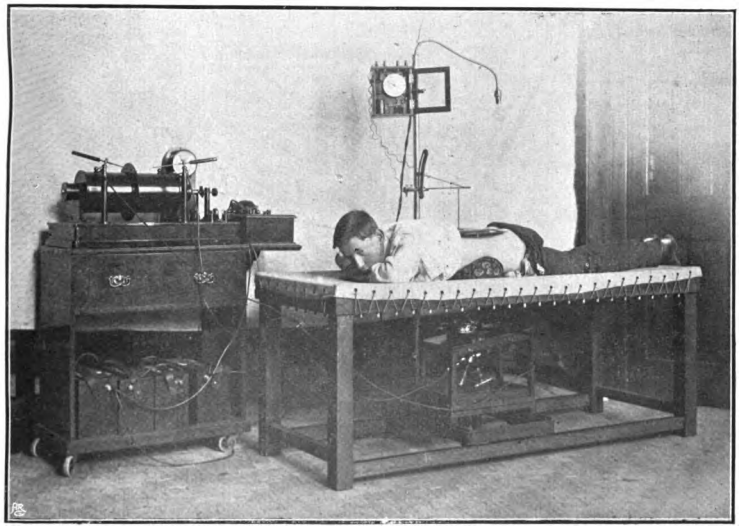
ON THE X-RAY DIAGNOSIS OF CALCULI IN THE URINARY TRACT.

By ARCHIBALD D. REID, M.R.C.S., L.R.C.P.

Electrical Medical Officer, King's College Hospital;
Radiographer to Evelina Hospital.

The reliability of the evidence afforded by skiagraphy of the presence or absence of a calculus in the urinary tract in earlier days was often questioned, but owing to the improvements in apparatus and technique it is now possible in



I.—Patient in position on couch.

almost all cases to give a definite positive or negative diagnosis. I propose to deal mainly with renal and ureteral calculi in this paper as cases of this kind present more difficulty than vesical or prostatic cases.

There have been several references to inaccurate negative results from skiagraphic examination during the past year, notably in a paper by Mr. Clement Lucas in the *British Medical Journal* of October 1st, where he quotes two cases of renal calculus in which the X-rays failed to indicate the presence of a stone. In the first case the stone was small and the patient was admittedly very stout. In the second case the patient was thin and the stone large and contained

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in a large pyonephrosis. In commenting on these cases Mr. Hugh Walsham in a subsequent number of the same journal, quoting from his cases, gives a warning against accepting a negative result from skiagraphic examination as proof that there is no calculus present.

While admitting that in very stout patients it may not yet be possible by this means to detect a small uric acid stone, yet I contend that in patients weighing less than 15 stone a definite positive or negative diagnosis ought to be possible if sufficient care and attention to detail be employed. It is only quite recently thate I have been able to obtain reliable skiagrams of patients above the weight of 13 stone, but with the apparatus described later there is not much difficulty in doing so.

I will now proceed to describe the apparatus used and then pass on to the preparation of the patient and the actual technique of taking the skiagrams employed at King's College Hospital.

The apparatus for exciting the tube consists of a 10-inch variable primary coil worked of the 100-volt continuous main with an electrolytic interrupter.

The tube, a heavy anode regulator (Muller), is enclosed in a box with lead glass or thick plate glass sides but open at the ends, enabling one thereby to regulate it easily. The top of the box is rendered opaque to the rays by lining it with a layer of red lead and a thick sheet of rubber, and a circular hole 3 or 4 inches in diameter is cut in such a position that the anode forms the centre of this circle. Above this is fixed an iris diaphragm with leaves of thick brass, which gives any aperture from ½ to 4 inches, and which can be altered by a slight movement of a vulcanite arm attached to its outer ring. This box is placed on a platform on the substage of a canvas-topped couch, and by means of this substage the box can be moved longitudinally or transversely.

The lower substage is marked out at 3 c.m. intervals for stereoscopic work.

Preparation of Patient.—It is extremely important that the patient's bowels should be as empty as possible when the skiagrams are taken, in order that no shadows should be thrown on the plate by fæcal material in the large intestine which might superpose the kidney shadow and be mistaken for a calculus. The importance of this process was well exemplified in a case where a skiagram was taken of the hip joint in a case where there had been a psoas abscess. The pelvis was included and a large shadow was seen occupying a position that might have been that of a vesicle calculus. The patient was known to have passed one or two small calculi per urethram. As no symptoms were caused thereby

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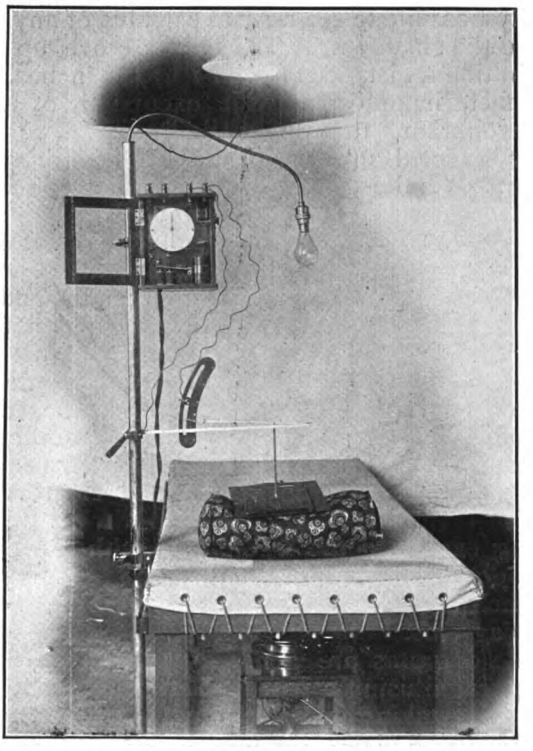
expectant treatment was adopted, and two months later another photo taken. The large shadow had disappeared, but there was an undoubted founded calculus present about ¾ inch in diameter, which had been completely hidden by the shadow of what must have been a scybalous mass in the lower bowel. At the time the first photo was taken the patient was taking a tonic containing iron, which



II.—Apparatus showing clock and mercury contact worked on relay circuit.

may account for the density of the shadow. The routine treatment is to keep the patient on light diet and a saline aperient for two days previous to taking the skiagrams. The night before the patient is given a purge consisting of:

Pulv. Jalapæ
Pulv. Scammon } a a gr. XV.

and on the subsequent morning a long tube enema is administered, and the skiagrams taken before the patient is allowed a meal.

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Technique of taking Skiagram.—The patient is placed on his abdomen on the couch, and a circular air-pillow made of thin rubber, 6 inches in diameter and 2 feet 6 inches long, inserted underneath him between the lower ribs and the iliac crests. This serves a double purpose in compressing the abdominal contents, and also making the back flat, so that the plate will lie in accurate opposition thereto in its full extent. The tube box is then arranged with the diaphragm wide open and the whole area examined with the screen. It is generally possible to see a renal calculus of any size on the screen, and the shadow will be seen to move up and down with respiration a distance of from 1 to 1½ inches.

This fact, namely the wide excursion of the kidney during respiration, though well known, has not been sufficiently insisted upon with regard to skiagraphy for calculus, and it is the omission to restrain respiration during the process that has largely contributed to the inaccurate results that have been sometimes obtained. This can be well seen in the accompanying photographs, all of which were taken with the same exposure, etc. (20 seconds), and under the same conditions, the only difference being that in 1 the breathing was not restrained, in 2 the breathing was absolutely restrained, and in 3 the smallest diaphragm was used with breathing absolutely restrained. It is striking that although such large calculi are present, in 1 nothing definite can be seen; in 2 they can be distinctly seen; while in 3 the detail in them is very much clearer and more marked.

Having examined the whole area with the screen with the large diaphragm is well to put on a small one and examine each area separately, and if nothing can be seen to take the skiagrams.

Three skiagrams are generally taken, the first with a 3-inch diaphragm using a 10×12 plate with the tube centred under the spine taking in both kidneys, and ureters and the other two on 10×8 plates, the tube being centred under each side, using the smallest diaphragm that will include the whole kidney. In all cases the anode of the tube is as nearly as possible 20 inches from the plate.

The plate is enclosed in two light tight bags and placed film downwards on the back and kept there either by placing a weight on it or by strapping. The patient is then directed to take several long breaths and then to hold his breath in the position of full inspiration. This phase of respiration is chosen because it brings the upper end of the kidney down and gets it clear of the ribs as far as possible, and also because the patient is thereby able to hold still longer than in expiration.

An exposure of 5 to 30 seconds, varying with the size of the patient, is then given at a current of 15 ampères through

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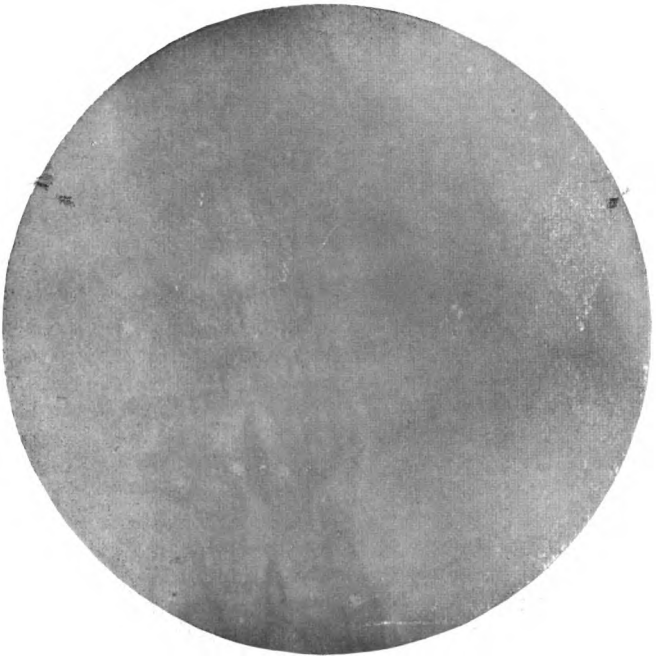
the primary of the coil. In most cases it will be possible to get the desired exposure in a single inspiration. In the case where this is not possible the same result can be obtained by divided exposures, which are made for shorter periods with a rest between each, the current only being allowed to pass through the tube when the patient is in the position of full inspiration. To do this the operator, holding the commutator or a cut-out in his hand, should fix his head so that his eyes are on a level with the plate and mark a chalk line on



III.—Breathing unrestrained.
Large diaphragm.

the opposite wall which will just coincide with the line of the plate on the patient's back at full inspiration, and thus he can be quite sure of getting his exposures all at the same phase of respiration.

In some cases it is well to make another exposure at expiration as well, the use of which was well shown in one case where, at inspiration, the shadow of a small stone coincided exactly with the end of the last rib, and would have been missed but for the evidence of the second plate.

In all cases control photos should be taken under the same conditions two days later.

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To obviate the difficulty of obtaining the same phase of respiration in divided exposures I have lately employed the following method. On the photographic plate a lead plate, from the centre of which projects a rod with a small fork at the top, is placed. From a pillar at the side of the couch attached to the lower stage holding the tube projects an arm carrying a dial on which there is placed an insulated moveable contact, and another arm parallel to this carries a jointed lever which terminates in a fork.

The lever is carried on a lateral support at right angles to the arm that bears it, and is so arranged that the edge of the dial is between its two terminations. A relay circuit consisting of small dry cells, a small electro-magnet, and a platinum contact was first employed, but it was not satisfactory as the platinum contacts were apt to stick, so a mercury contact was substituted. This is inserted in the primary circuit and connection made with the movable contact on the dial and the lever. The lever is then placed in position in the fork on the lead plate and the respiratory movements are communicated to it. The movable contact is then adjusted, so that the circuit is completed at the required phase of respiration by the lever touching it. The required exposure is obtained after the patient has taken a sufficient number of breaths, and the time can be recorded accurately by means of a clock-movement in which, by means of a small electro-magnet on a relay circuit, the clock only records during the flow of the current. This method is especially valuable for stereoscopic work, for it ensures identical exposures and it obviates the overheating of the tube which occurs when using the electrolytic break continuously for any length of time.

In the illustrations the apparatus is shown. In (1) the patient is shown in position on the couch. The small box on the pillar contains the mercury contact and the clock.

In (2) the apparatus is shown more clearly.

The disadvantages of this method are :

1. It is not easy to work with a low tube with the electrolytic break so that there is the possibility of missing a small uric acid stone. Up to now, however, the results of operation have not shown that this has happened.

2. The position precludes the use of a water-cooled tube and the intensity of the current overheats the heavy anode in a very short time. This automatic device, however, if divided exposures of not more than 5 seconds each are employed, removes this objection.

The advantages are :

1. A screen examination of the whole area can be easily and quickly made.

2. The respiratory movements can be exactly controlled.

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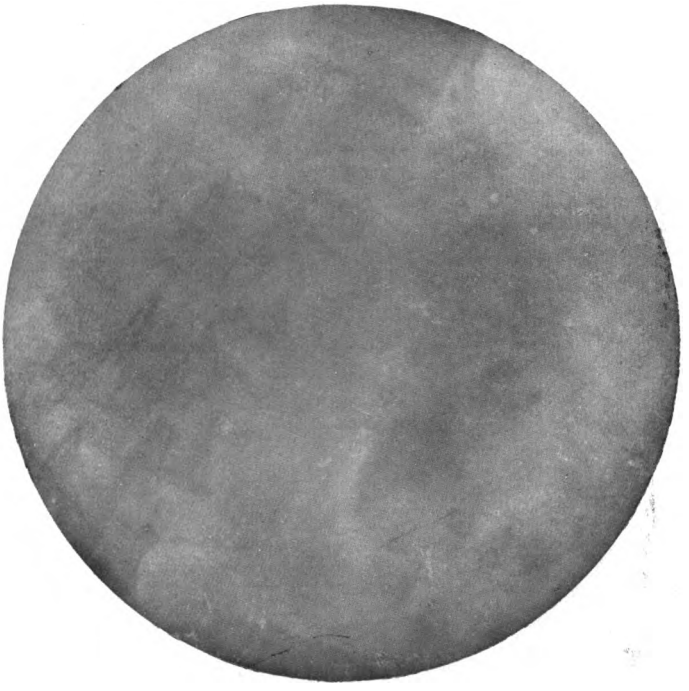
3. Adequate compression is supplied by the patient's own weight.

4. The diaphragm can be exactly adjusted to take desired area.

5. Stereoscopic radiographs can be accurately taken in any phase of respiration.

With regard to stereoscopic radiographs for renal



IV.—Breathing restrained.
Large diaphragm.

calculus they are valuable in that they sometimes show small calculi where the diagnosis would be doubtful otherwise.

To take them close fitting bags, such as Hinton's, should be employed. The same apparatus is used but the bags have lines drawn on the backs at right angles to their central point. The lead plate is similarly marked. The first plate is placed in position and the tube box moved 3 c.m. to one side. The lead plate is placed in position with the marked lines coinciding with those on the back and the lever adjusted.

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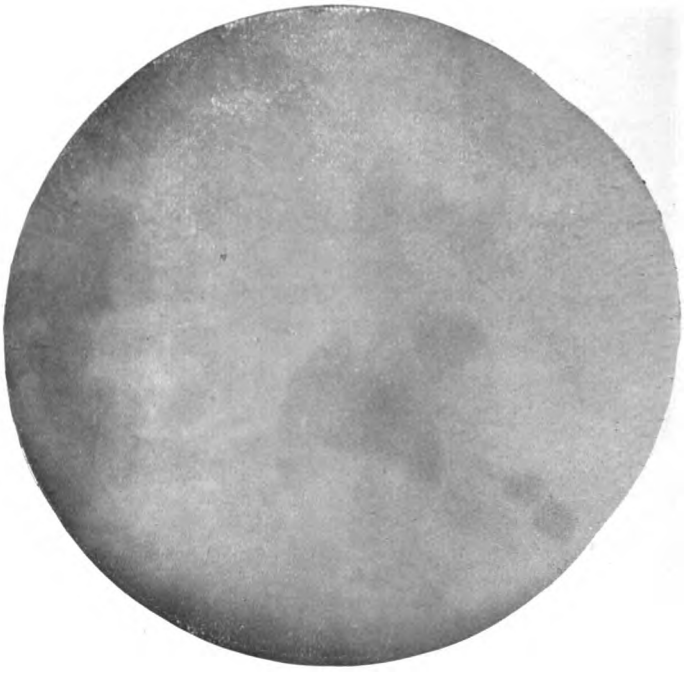
The position for the second plate is then marked on the patient's skin by continuing the vertical line from the plate and drawing another at right angles along the edge of the plate.

After the first skiagram is taken the tube box is moved 3 c.m. to the other side of the central position, the second plate placed in position and the procedure repeated. It is most convenient to reduce these negatives to lantern size and



V.—Breathing restrained.
Small diaphragm.

mount on ground glass or opal and examine them with a small hand stereoscope.

Development of Plates.—Lumière's X-ray plates have been used throughout which, though expensive, have been found to give the best results.

The development should be slow and prolonged, and should be continued until the plates are absolutely opaque to the red light 8-candle power behind the thickness of ruby glass.

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In hot weather there is sometimes a tendency for the films to fall off the plate. This can be obviated by rubbing the edges of the plates with paraffin wax.

A pyro-metol formula has been used for development. A stand developer of a weak solution of glycin gave good density, but it was found difficult to prevent a deposit on the surface of the film. To prevent this I have had a tank made with a side chamber communicating only at the top and the bottom with the main chamber, and in this is placed a paddle wheel revolved by a closed water motor attached to the tap, which I hope to show at a later date.

The plates must be constantly watched and the solution kept moving over them or they will develop unevenly. After fixation in 5 ozs. to the pint hyposulphite of soda they should wash for one hour in running water, and before being put up to dry the film side should be carefully and firmly rubbed over under water with a clean wool pad. This will remove all stains which, in renal cases where the shadow may be very slight, may be misleading.

Examination of Negatives. — A good negative for a case of calculus should show the last two ribs, the crest of the ilium and the vertebral column, the outline of the kidney and of the psoas muscle, but these shadows should be light and the negative would be a weak one of the bony skeleton.

The best way to examine the negative is to make it the only source of transillumination by fitting it in a window in a dark room and examining it at a distance of two yards or more, being careful not to omit to get a good view from an angle of 45° both laterally and vertically, for sometimes a distinct shadow can be seen by this means that would otherwise be missed.

Results.—During the last two years 150 cases have been skiagraphed for possible calculus in kidney, or ureter, or bladder.

Positive Diagnosis given from X-Ray Examination.		Found by Surgeon at Operation.
Kidney	25	23 (The other one P.-M.) 1 missed (small collection of sandy material.)
Ureter	3	2 (The other passed subsequently.)
Bladder	8	7

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Negative Diagnosis from X-Ray Examination.	Found by Surgeon at Operation.
Kidney 12	1
Bladder 15	1

Vesical or Prostatic Calculus.—It is important in these cases also to have the bowels as empty as possible. The respiratory movements should be restrained also, but it is not so important.

The best method is to take three photos:

1. Direct antero-posterior: Patient lying on plate with tube above.
2. Oblique postero-anterior: Patient lying on abdomen and tube pointing through the outlet of pelvis.
3. Oblique antero-posterior: Patient sitting on plate on chair leaning forward with legs well separated, tube pointing obliquely. If patient is very fat a flannel bandage should be wound tightly round abdomen.

Number 2 is useful if there is a loose vesical calculus as it brings it very close to the plate.

Number 3 gives the best view if the calculus should be encysted near the base of the bladder or in the prostate.

Conclusions.—From the foregoing the following factors must be borne in mind for accurate work:

1. Powerful apparatus and short exposure.
2. Efficient purgation of patient.
3. Inhibition of respiratory movements.
4. Smallest diaphragm possible.

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THE RÖNTGEN CONGRESS IN BERLIN, 1905.

SUNDAY, APRIL 30th.

Supported by an exceptional number of German and foreign experts and by representatives of many States the first Röntgen Congress associated with a Röntgen exhibition was opened to-day in Berlin.

At the time of opening every seat in the large hall was occupied ; the Imperial Chancellor was represented, and the Minister for the Interior v. Bethmann-Hollweg was present in person. Many other State authorities and institutions sent representatives as did the American Medical Association, the British Electrotherapeutic Society, and the British and American Röntgen Societies.

The President, Professor Eberlein, in his opening speech reminded the Congress how in December, 1895, the news of the discovery of the Röntgen rays had travelled through the whole world like a fairy story and had forced itself upon the attention of all classes of people with an almost unheard-of rapidity ; very soon hopes and wishes were expressed on all sides, the fulfilment of which could scarcely be expected, most of them being well-nigh impossible. Röntgen himself left unsettled the question of practical applications in Medicine, but in a most masterly manner enunciated the fundamental physical laws for further work and especially those referring to the photographic properties of the rays. Physicians, scientists and mechanicians threw themselves into this new channel of research work with the greatest enthusiasm and surmounted the not inconsiderable difficulties with unusual quickness and energy. The instrument-in-chief of X-ray investigation, the so-called X-ray tube has, in the not quite completed decade which has elapsed since its first appearance, undergone such a change that to-day the original tube is regarded as little more than a toy. The Röntgen rays soon became an indispensable help in many inquiries but it at once became necessary to thoroughly understand their destructive properties. While, however,

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most careful rules had to be made for the regulation of the rays in preventing their action on human tissues for harm, wonderful advantages had been gained in the improvement and cure of many skin diseases by their means. Manufacturers also had many uses for these invisible rays which put into their hands an entirely new method of discriminating in collections of raw materials between the genuine and the spurious. In this discovery then a great number of issues were involved. Röntgen himself in his unassuming way had given them the indeterminate name of X-rays. Universal approval was, however, granted when in 1896 Professor Koellicka, in a treatise before the Physico-Medical Society of Würzburg, suggested that in honour of their discoverer they should receive the name of Röntgen rays. It was the object of the Röntgen Union to combine with the Congress an act of homage to the eminent investigator to whom were due the fundamental principles of all these advantages, and they had invited Professor Röntgen as their guest of honour, but with the usual modesty of the learned he was absent from the Congress. The expression of their respect must then be carried out by the sending of the following telegram : " The delegates assembled at the opening ceremony of the Röntgen Congress in Berlin present to the gifted scientist and discoverer of the Röntgen rays their respectful and enthusiastic homage."

The assembly agreed to the proposed sending of this dispatch with hearty applause and also to a second telegram to his Excellency v. Bergmann. After Professor Eberlein had welcomed the various representatives present he declared the Congress open. The Under Secretary of State Herr Weber then spoke, and was followed by Dr. Leonard of Philadelphia in the name of the representatives of other countries, and by Dr. Immelmann of Berlin. R.H.C.

(To be continued.)

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NOTES AND ABSTRACTS.

The Action of X-Rays on the Blood.—Helber and Linser exposed rabbits, rats and dogs to the X-rays for protracted periods of time, and found on making blood examinations that a very marked destruction of the leucocytes resulted. In some cases complete aleucocytosis was observed, but usually after a climax of leucolytic action had taken place a gradual, partial return of the white cells was noted. Histological study of the various leucocyte producing and other organs did not reveal any accumulation of the cells in these regions, so that it is evident that the process is a truly destructive one. The rays therefore appear to exert a selective action on the leucocytes, the nuclear substances being the most susceptible to damage. The lymphocytes suffer earlier and to a greater degree than the other forms. The destructive process appears to go on not only in the blood-forming organs but especially in the circulation itself. The red cells, the blood plates, and the hæmoglobin also suffer to some extent but to a much less degree than the leucocytes. In nearly all cases renal lesions presenting the picture of an acute nephritis were observed, and the authors suggest that possibly a deficiency in alexin resulting from the wholesale removal of the leucocytes may have the effect of rendering the kidneys more susceptible to the action of bacteria.—*Münch. Med. Woch.*, April 11th, 1905. R.H.C.

* * *

The Action of the Hydro-Electric Bath on Blood-Pressure.—Reilingh publishes a number of observations made on healthy subjects as well as on patients under treatment. He finds that in healthy individuals the blood-pressure is lowered to the same degree when using the faradic current as when the galvanic or the combination of faradic and galvanic are employed. When the passage of the current is stopped the blood-pressure quickly rises again to its former height, but after a long application of the current the rise is slower and does not for some time reach its initial level. When blood-pressure is abnormally high (*e.g.* in arteriosclerosis and chronic nephritis) the effect is more marked and the diminution of pressure much more permanent.—*Zeitschrift für Elektrotherapie*, May, 1905. R.H.C.

* * *

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Radiotherapy of Lipomata.—Detailing a number of cases Nogier arrives at the following conclusions:

1. X-rays have an action on lipomatous growths, but this effect is a slow one and the treatment must be continued for a long while. The rays used are of medium penetration and the dose small at intervals of about ten days.

2. The use of tincture of iodine in Dercum's disease seems to help the treatment. But the action of the rays is a genuine one as symmetrical tumours have not diminished in the same patient, while those growths which were irradiated have been seen to diminish in size.

3. The effect on the general health is a good one, especial improvement being sometimes noticed in the mental condition.

Nogier has never noticed complete disappearance of a lipoma under X-ray treatment.—*Arch. d'Elect. Médicale*, May 25th, 1905. R.H.C.

* * *

The Bactericidal Action of Light in the Finsen Treatment.—Klingmüller and Haelberstaedter say that numerous experimenters have shown that the rays of the concentrated arc light exert a highly bactericidal effect when applied to bacteria in surface cultures on artificial media. The conditions are very different, however, in the treatment of lupus vulgaris and the authors made numerous tests in different ways by means of which tubercle bacilli in living tissues and in cultures were exposed to the Finsen rays. As the result of this work they found that in the Finsen treatment tubercle bacilli, even in relatively superficial situations, are not killed, and that the strongly bactericidal properties of light are not concerned in the treatment of cutaneous tuberculosis by this means.—*Deut. Med. Woch.*, April 13th, 1905. R.H.C.

* * *

Radium in the Treatment of Cancer.—During the past week sensational reports have appeared in the newspapers as to the curative effects of the "Lieber treatment" of cancer. A press agency, which for years past has made itself notorious for the untrustworthiness of its reports of medical discoveries and new cures, gives details of the case of a prominent citizen of the United States. It is stated that an X-ray examination showed that the cancerous area had been reduced by the Liebler (*sic*) treatment in three weeks from 18 to 7 square inches. It is added that the rapidity of the abatement of the mischief surprises the physicians in attendance, who now hope to find at the next examination that the growth has

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disappeared. The patient, who is the President of a university, is reported as saying that he is "feeling fine"; he has gained 12 lb. in weight, and is working eight hours a day. For his sake we hope this is true; but for the sake of other sufferers who may be deluded by vain hopes in reading of the marvels of radium, we think it right to state that the gentleman whose name is put forward as the inventor of the method has emphatically repudiated the accounts of the treatment and its effects which have been published in the American papers, from which the reports which have found their way hither are taken. The following letter from Mr. Hugo Lieber appeared in the *New York Medical Journal* and *Philadelphia Medical Journal* of April 22nd:

"I note that the daily papers of April 19th contained sensational articles attributing to me the treatment and cure of a case of cancer at the Flower Hospital, in reference to which I beg leave to say that I have never been in the Flower Hospital in my life, and that the statements contained in these various articles are in the main false and wholly misleading. My only connexion with this matter was the preparation, some months ago, of some celluloid needles coated with radium, which were made by me at the request of Dr. Piffard. For about two years I had been trying to obtain radium in such form as to overcome the obstruction of the container so as to make the *alpha* rays available for practical use, which I finally succeeded in doing by what I have termed radium coating. This only is the novel feature of my invention. My only connexion with the case was the preparation of the radium-coated celluloid needles at the request of Dr. Piffard, who desired to try them in a case of cancer. I have never seen any of the patients nor treated any of them, and if any credit is due for the use of these needles prepared by me it is to Dr. Piffard."

The particular method of employing radium in the case in question was described by Dr. Piffard in an address delivered before the Medical Society of the County of New York on March 27th, 1905, when he also exhibited the radium-coated needles. While the results obtained have been quite satisfactory so far, Dr. Piffard does not consider that a sufficient number of cases has yet been treated to justify any final conclusion as to the real value of the method.—*British Medical Journal*, May 6th, 1905.

* * *

The Action of X-Rays on Barium Platino-Cyanide.—Experimenting with barium platino-cyanide Bordier and Galimard find that its change of colour when exposed to

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X-rays is a phenomenon of dehydration and that the return of the salt to its initial state is due not to the action of light but to a re-hydration. When the salt becomes brown (*i.e.* dehydrated) it loses its fluorescent properties. These facts are of great importance in view of the use of Sabouraud's pastilles as a measure of dosage. I have carefully repeated these experiments and come to the same results. When the atmosphere is moist dehydration is somewhat delayed and therefore the pastille does not so quickly acquire the "teinte B" and too great a dose of the rays is given. It follows then that, in England at any rate, the value of Sabouraud's radiochromometer is greatly diminished. This dehydration may also be obtained by heat, and as the distance 8 c.m. is practically on the glass of the tube the pastille, if a fairly large current is used, wiil get hot and consequently change colour too quickly. By using a tube the anode of which got hot very readily, I was able to change the colour of a pastille from teinte A to teinte B in 8 minutes, while only using a current of ½ m.a., this procedure with a water-cooled tube occupying 17 minutes. Radioscopy is also affected; if the fluorescent screen is allowed to become warm, especially if in a dry atmosphere, it is liable to lose some of its fluorescent properties. R.H.C.

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CORRESPONDENCE.

We have received the following letters:

48, WIGMORE STREET, W.

DEAR SIR,

A few years since, at the suggestion and with the advice of leading Surgeons and Physicians, and when Radiography was a novelty, we added to our Instrument business a department for the production of Skiagraphs under the direction and supervision of the patient's medical adviser.

We have to thank the profession for kind and liberal support, but the department has proved unimportant from a financial point of view, and distasteful to some medical men who have themselves taken up this work.

Further, the tenure of the premises at 62, Welbeck Street being about to terminate, we have decided, under the circumstances, to discontinue this branch of business from the 30th instant.

Mr. Coldwell, who has been our operator for nine years, has arranged to purchase our apparatus and to establish a similar business on his own account.

His work in the past for us is now well known, and is the best evidence of his skill and competence in Röntgen Ray and Photographic work, and will, we cannot doubt, be widely and highly appreciated.

We are, dear Sir,
Yours faithfully,
ALLEN & HANBURYS, Ltd.,
CORNELIUS HANBURY,
Director.

62, WELBECK STREET, LONDON, W.

DEAR SIR, *April, 1905.*

Messrs. Allen & Hanburys Ltd. having relinquished their X-ray Department, which has been carried on under my direct supervision for the past nine years, I beg to inform you that I have purchased the whole of their extensive Röntgen Installation, and from 1st May next shall carry on the business of an expert Radiographer to the Medical Profession, solely on my own account.

Relying upon the satisfactory results I have hitherto obtained for the Profession, I beg to solicit for myself a continuance of the kind patronage already accorded to Messrs. Allen & Hanburys Ltd.

For a few weeks the business will be conducted as usual at the above address, but, owing to the early expiration of the present lease, other suitable premises will be taken, of which due notice will be sent you.

The charges will be as moderate as possible, consistent with the highest standard of work procurable.

Trusting to receive your valued support,
I have the honour to remain,
Your obedient Servant,
W. A. COLDWELL.

Comment is unnecessary!

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GRISSON RESONANCE APPARATUS.

weakness of instruments for generating rrents consists in the interrupter. The fficulty is one of the greatest advantages in nance apparatus which we have seen in srs. Isenthal's, and which was recently he Royal Society. The Gaiffe apparatus a description in our number for October, advantage of requiring an alternating cur- as unsuitable for use by the majority of who have only the continuous current With these new instruments the contin- employed. The secondary impulses in e unidirectional than those obtained by ters and accumulators, immensely more

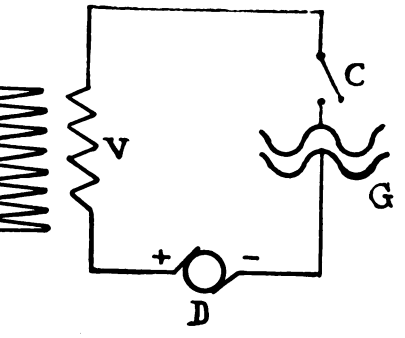

Diagram I

completely under control. In addition work it yields high frequency and sinu- motor for surgical or vibratory purposes, nall lights and cautery without wastage in o operates the resonance electro-magnet. angement replaces the interrupter by a r electro-magnetic reverser) which works ns no mercury, no liquid of any sort, no and therefore requires no more attention tor of a motor or dynamo. Its function as we proceed.

ase of a condenser *G* (*diagram 1*) which is the primary of a suitable coil *V* to a source a switch or similar device *C*. On closing urrent impulse from *D* rushes through *V*

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(inducing a secondary current in the secondary) and charges the condenser *G*; as soon as this is accomplished, there being equal potentials at *G* and *D*, switch *C* may be opened, no current or spark taking place at this interruption, and if *C* is so constructed as to subsequently connect the condenser to the reverse poles of the source, then the play may be repeated and a new current wave sent through the primary. These impulses always have the same direction through the primary and thus in the secondary induce currents equally of one (the reverse) direction only. The switching device *C* is so

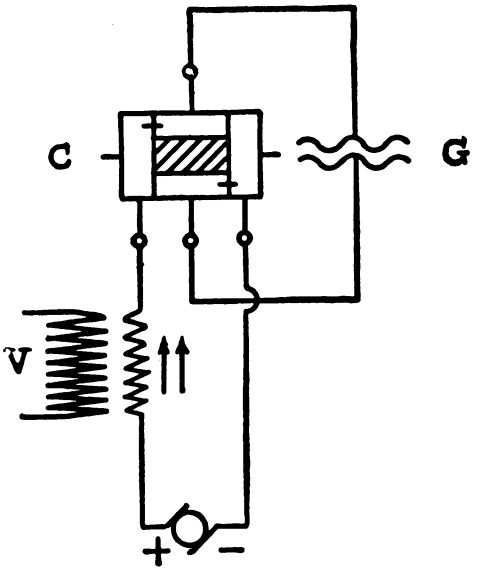

Diagram II.

designed that the time of opening and reversing may be varied within wide limits and thus the secondary discharge may be greatly modified as occasion demands.

The condenser *G* must be of very large capacity in order to allow of a large current flowing into it, and this capacity is secured by using electrolytic condensers.

A condenser, as is well known, consists of two metallic or conducting plates separated by a dielectric or non-conductor, and for a given dielectric constant the capacity may be increased either by increasing the size of the conductors or by decreasing the thickness of the separating dielectric.

This latter plan has been followed by Mr. Grisson in constructing the electrolytic condenser used in the new appa-

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ratus, the dielectric being, in fact, only a minute fraction of a millimetre in thickness, being represented by a film of aluminium hydroxide formed electrolytically upon the surface of suitably shaped aluminium plates immersed in a special electrolyte. The two conducting plates in this condenser being the aluminium plate and the electrolyte, separated by the film, which withstands pressures up to 120 volts.

The third essential part of the arrangement, the reso-

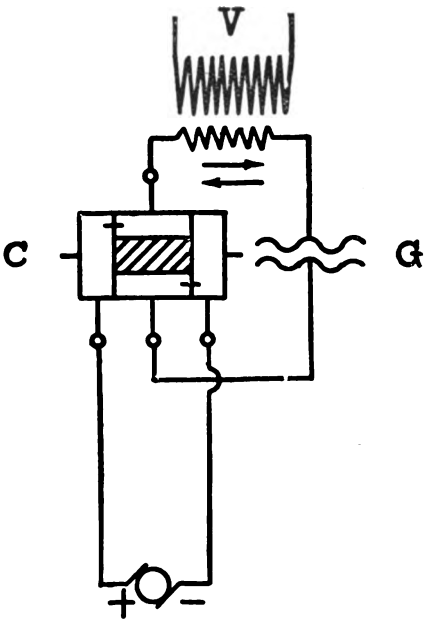

Diagram III.

nance coil, derives its name from the fact that, by suitably choosing the self-induction of the circuit in relation to the capacity of the condenser and the speed of the reverser, a condition of resonance is established which very greatly increases the induction effects in the coil; so that every current impulse through the primary results not only in one secondary discharge, but that also all the higher harmonics are transformed without being damped out.

A suitable coil, having a definite self-induction, may also be placed in that part of the circuit which is traversed by alternating impulses (*diagram 3*), and is either constructed

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as the primary of a high frequency coil or as the resonance electro-magnet.

If we provide a second Grisson condenser in the alternating circuit and properly dimension the core and windings of an electro-magnet, a periodical magnetic field is produced which is said to powerfully affect the nervous system; we have ourselves noticed distinct sensations of unsteady light when approaching the eye to the pole of this magnet. The pressure of the supply is raised to twice its original amount at the terminals of the magnet, and thus a suitable lamp across these terminals serves to indicate when the maximum of this resonance effect is attained.

The price of this apparatus is not prohibitive, and varies with the complexity required. Existing induction-coils can be adapted to it, thus lessening the cost. We think it will prove especially useful where portability is not an essential; it is naturally not suited for taking out to a patient's house, a disadvantage which it shares with the Gaiffe transformer and all other modern powerful instruments.

R.H.C.

X-RAYS AND PSORIASIS.—Marquès has treated a very intractable case of psoriasis in which all the usual drugs had been ineffectually tried for four years. The disease was very marked on the back, thorax, legs, forearms, and especially the hands. Marquès decided to treat the hands with X-rays, the sides and back by the high frequency effluve, and the thorax, knees and legs by static effluvation. Oil of cade was applied to all parts in the intervals between exposures. On September 14th, 1904, the hands were exposed for ten minutes to a low tube at a distance of 20 cm. from the anticathode (five minutes to the dorsal and five to the palmar aspect). Similar exposures were given on the 16th, 19th, 23rd and 26th. On the 28th the healthy skin was slightly erythematous, the affected parts much more so, six minutes' exposure only was given. The regions treated by the high frequency and static currents were unaffected. September 30th. Erythema accentuated, scales almost entirely gone. The other forms of treatment were then discontinued and all the affected parts exposed to X-rays, with the result that on October 31st the patient appeared completely cured. Five months afterwards there was still no recurrence. (*Arch. d'Elect. Méd.*, March 10th, 1905.) R.H.C.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by REGINALD MORTON, M.D., *Secretary.*

The Thirtieth Ordinary Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on Friday, May 26th, 1905. The President, Dr. DONALD BAYNES, in the Chair.

The minutes of the Twenty-ninth Ordinary Meeting were read and confirmed.

W. B. KNOBEL, M.R.C.S., L.R.C.P., 32, Tavistock Square, W.C., was elected an ordinary member of the Society.

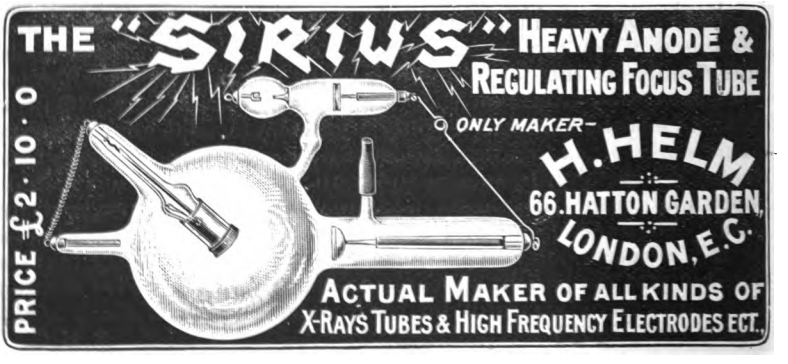
Mr. A. D. REID then read his paper on the "X-ray Diagnosis of Calculi in the Urinary Tract." The paper was illustrated with lantern slides and appears elsewhere in this issue.

In connection with the paper Mr. Reid showed an automatic method of regulating the breathing while taking skiagrams.

A vote of thanks to Mr. Reid was proposed by Dr. Lewis Jones, seconded by Dr. Horace Manders, and carried unanimously.

Messrs. NEWTON & Co. showed a new High Potential Transformer for High Frequency and X-ray work.

The proceedings then terminated.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ACTUAL MAKER OF ALL KINDS OF X-RAYS TUBES & HIGH FREQUENCY ELECTRODES ECT.

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MEDICAL

Electrology and Radiology.

No. 7. JULY, 1905. Vol. VI.

EDITORIAL.

The parasitic theory of cancer, which at one time seemed as if it was going to hold the field, has received lately two severe blows. In the first place it has been pointed out that the Plicanier bodies, which can be demonstrated fairly readily in malignant growths, are merely normal cell structures corresponding with the hetero-typical mitoses. These are present normally in the cells of the testis, which are undergoing similar divisions. In the second place the organism which has been described by Doyen and the semen prepared by means of this organism have not stood the test of time, and can hardly be regarded in association with malignant disease as cause and cure.

The preliminary report of the French savants entrusted with the investigation of the organism and the semen is distinctly antagonistic to the claims set up by the original discoverer. The enquiry extended over five months, and 26 cases were kept under observation while under treatment. Beyond the slight improvement which follows the use of sera in general, the committee were unable to find a single case in which the signs of improvement were unequivocal. Of the 26 cases, in 20 the symptoms were distinctly aggravated, in 3 recrudescence took place, while 3 were set aside as having been insufficiently observed. The committee were unable to satisfy themselves as to the existence of the "micrococcus neoformans." It is well known that there are a large number of drugs which, taken internally or applied locally, cause a temporary improvement in cancer, but this is transient. These cases lend colour to many so-called cancer cures, which at first offer promise of results, but in the end bring the treatment into disrepute. Added to this the difficulty which is often encountered even by expert pathologists in giving a definite diagnosis in cases of suspected malignant disease, especially sarcomata, is responsible for the apparent success of method of treatment which *a priori* would seem to be inefficient.

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SOME IMPROVEMENTS IN HIGH FREQUENCY APPARATUS.

By W. Ironside Bruce, M.D.,

Physician in charge of the Electrical Department, Charing Cross Hospital.

One cannot fail to be struck after doing work with high frequency currents that the noise made by the apparatus is a great drawback. This trouble has been tackled successfully by the instrument makers to a certain extent, but it could not be said that the difficulty has been got over. It is not necessary to point out that to the operator and the patient this point is of the utmost importance.

The spark gap is responsible for 50 per cent. of the noise, and, in addition, it gives a considerable amount of trouble. One of the best ways of dealing with it is to close it in with glass. This is the method generally adopted, but it is often insufficient, for two reasons.

First, the glass receptacle used is too small, and, as a consequence, the walls of the receptacle come too near the spark. The formation of moisture, which takes place as a result of the passage of the spark through the air, leads to a deposit of fine drops of water on the surface of the glass. This allows of leakage of the current along the surface of the glass, which destroys the function of the gap.

Secondly, the receptacle is often made too tightly, and it is not possible to enclose the gap completely so that the sound of the gap cannot find its way outside.

The first objection is readily got over, and I think this has been done by some of the instrument makers. The glass enclosing the gap is so made that it is carried wide of the spark. The sides of the receptacle are kept about 2½ inches from the points of the gap. With this arrangement no trouble is possible with surface leakage, especially as, in addition, the inside of the receptacle is coated with vaseline.

The second difficulty has also been fairly successfully remedied. One way is to enclose the gap in a double receptacle. This method is fairly effective, but the arrangements for

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cleaning, which is a very important point, are rather complicated with double glass to attend to.

Another method is that the glass receptacle is made with a division in the centre, which is provided with ground glass surfaces so arranged that they are held in apposition by a screw attachment at either end of the gap.

This works well, except that the ground glass surfaces become an effective seal only by the use of vaseline. The heat developed by the spark with prolonged use melts the vaseline, and the seal becomes imperfect. This allows the sound to escape. The best way to get over this is to substitute for the vaseline a washer of asbestos, which allows of a perfectly tight joint not destroyed by heat.

The glass is, however, not made heavily enough, and the sound of the spark is still appreciable. In order to still further reduce the sound it is not a bad plan to enclose the whole receptacle in a thick wooden box lined with felt. This so far reduces the sound of the gap that it becomes almost inappreciable.

The noise in the high frequency transformer is not entirely caused by the spark gap, the Leyden jars being responsible for a large proportion.

It is possible, however, to a large extent to eliminate this production of sound.

If the ordinary Leyden jar is coated with vaseline inside and out, and the jar filled with water, the efficiency of the jar is not interfered with, and the noise is reduced to a minimum. There are, however, several points which have to be attended to. The water in the inside must be brought up to at least ¼ inch above the level of the tinfoil on the outside of the jar. If this is not done the jar is very apt to perforate at the level of the water inside. This is due to the great strain put on the glass at this point. The water level being raised a little above causes a breach on the outside of the jar from the outer coat to the upper level of the water, and this distributes the strain and prevents perforation.

Another useful addition is to pour oil on to the top of the water inside the jar to the depth of about 1 inch. This

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prevents the water from evaporating and creeping up the sides of the jar, so leading to leakage of current. The oil further prevents the production of sound.

I have found that above improvements add much to the comfort of the patient and myself, and I wish that they might prove useful to others.

NOTICES OF BOOKS.

ELECTRICAL METHODS IN THE TREATMENT OF AFFECTIONS OF THE STOMACH, ETC.

The matter contained in this little book is based on some papers by Dr. Herschell, which appeared in this Journal from January to July last year. They are here slightly altered and rearranged, with considerable additions, especially in the way of illustrative clinical histories.

The author lays considerable stress on the undoubted fact that the older forms of electrical treatment, which could be conducted with the aid merely of batteries for producing continuous and interrupted currents of low potential, have been too much overlooked of late in favour of the newer modalities, which entail the use of considerably more costly and intricate instruments; and we are inclined to agree with him when he states that it has not yet been definitely proved that the high frequency currents will accomplish very much more than the galvanic and faradic, while it is certain that they are much more dangerous in unskilled hands.

The descriptions of apparatus and technique are certainly elementary; but Dr. Herschell intends them for the guidance of the general practitioner who has no special electrical training, and to him this book will undoubtedly prove useful. We would, however, suggest that simpler types of instruments than those illustrated might prove sufficient.

R.H.C.

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THE ACTION OF X-RAYS ON THE DEVELOPMENT OF THE HEN'S EGG.

By Drs. H. BORDIER and L. GALIMARD, of Lyons.

The action of X-rays on eggs in general has been little studied.

Perthes* in exposing cultures of ascaris megalocephala of the horse has found that cell-division was retarded, and that irregularities of division and abnormal embryos were produced. But this author neither indicated the quality nor the quantity of the rays employed.

Hen's eggs have been exposed to radium by Jan Tur. In examining the embryos after 45 to 48 hours' incubation he found that there were malformations present (absence of protovertebræ, etc.).

P. K. Gilman and F. H. Bactjer (Johns Hopkins University) have studied the development of hen's eggs which they exposed to X-rays for ten minutes daily. Unhappily these authors did not measure the quantity of X-rays employed. They found that development was accelerated; that it was afterwards retarded and became abnormal. At the end of four days they noticed malformations of the occipital region with hæmorrhagic areas. The membranes were often quite adherent to the embryo, were generally twisted and attached in an abnormal manner. When the feathers began to appear they were distributed in irregular patches.

The experiments we have undertaken have been with the idea of discovering the action of the X-rays emanating from a Crookes' tube on the development of hen's eggs artificially incubated in a stove kept at 40° for 21 days. In view of the enormous power that X-rays influence on healthy and pathological tissues, we have asked ourselves whether a large dose of the rays would hasten or retard the development of the embryo of animals high in the animal scale.

The dozen eggs used by us in these experiments were

* *Deut. Med. Woch.*, April 21st, 1904.

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laid on April 29th, 1905; half were kept as a control, the other half submitted to the action of the rays. The source of the rays was a regulating Muller tube with cooled anode, excited by an induction coil with a Schicketé-Maury interrupter.

The quality of the X-rays employed is defined by (1) the length of the equivalent spark-gap, which was 12 cm., and (2) Benoist's radiochromometer, which registered 7. The quantity at each application of half-an-hour was measured by Holzknecht's pastilles, which at the end of a quarter-of-an-hour (*i.e.*, in the middle of the exposure) registered between 7 and 8 H.; so that, as the tube did not vary, on account of the automatic regulation and its water-cooled anode, the total quantity of X-rays falling on the eggs was 15 H. in half-an-hour.

On May 1st six eggs were submitted to this dose. They were placed on cotton and touching one another. A thermometer placed on the eggs showed that the temperature did not rise above 22°, the surrounding temperature being 17°.

On the following day the eggs were put into an incubator at 40° at the same time as those that were being used as a "control." Fourteen exposures of this nature were given in all on the 1st, 2nd, 3rd, 4th, 5th, 6th, 8th, 9th, 10th, 12th, 15th, 16th, 17th, and 18th of May.

On May 22nd, after twenty days' incubation at 40°, we opened one of each batch of eggs; we found in the "control" a chick at term. The white and the yellow of the egg that was irradiated came out separately. As these eggs had only been incubated twenty days, we waited till the 24th of May before opening them all.

We then found that all the "control" eggs had developed normally. Not one of those exposed to the X-rays, however, showed a trace of commencement of embryonic formation: the white and the yolk were distinct, the white being more fluid than that of a fresh egg, the yellow more granular than normal. In the case of one egg the X-ray exposures had been stopped after the sixth application. That too showed no sign of developing embryo. On May 8th

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one of the six "control" eggs was exposed to X-rays for the rest of the period (that is to say receiving eight doses of 15 H.). In this egg an embryo was found corresponding in size to one six days old. Lastly, on May 10th, another of the "control" eggs was exposed once only to X-rays for half-an-hour. On opening this egg it was seen that embryonic formation, more advanced than that of the preceding egg, had been stopped at about the eighth day; that is to say that the development of the embryo had continued up to the moment when the egg was submitted to a dose of X-rays equal to 15 H. units.

From this last result we may conclude that a dose of X-rays of 15 H. stops the development of the chick embryo when this development has started, and that these rays prevent embryonic formation when they are applied to eggs which have not yet been incubated. We have tried to find out the quantity of X-rays which, after having traversed an egg, emerges from the other side, the long axis of the egg being horizontal. To do this we placed one of Holzknecht's pastilles underneath an egg on to which we allowed a dose of 15 H. of the rays to fall. We then found that the pastille had taken a tint which corresponded to a little less than 3 H. In consequence we concluded that the quantity absorbed by the substance of an egg to which a dose of 15 H. is applied is about 12 H.

To complete this experiment we examined the albumen of the eggs in which embryonic formation had been entirely prevented by the X-rays. This albumen was with difficulty coagulated by heat, and was, as we have said, much less viscid than normal white of egg. A tube 3 cm. × 4 mm. filled with this coagulated albumen had not been completely digested by an artificial gastric juice at the end of about sixty hours.

It therefore results that albumen thus exposed to X-rays has been modified in its biological properties, and, consequently, in its constitution. We should say, in conclusion, that this albumen did not appear bad; there was no sign of decomposition. R.H.C.

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THE RÖNTGEN CONGRESS IN BERLIN, 1905.

MONDAY, MAY 1st.

(Continued from page 146.)

At the afternoon sitting of the Congress, Dr. ALBERS (Schönberg) proposed that a Commission should be formed to recommend a uniform nomenclature of all technical expressions connected with Röntgen rays. This motion was passed by the Congress as answering to a daily-increasing need.

Dr. LEONARD (Philadelphia) was of opinion that the importance of Röntgen's discovery to medical science could not be better demonstrated than by the results of its application in cases of stone in the kidney and ureter. Until lately the distinction had not been sufficiently demonstrated. It had been left to X-rays to prove that calculi occur more frequently in the ureter than in the kidney. The great importance of the Röntgen ray examination is that the doctor is thus more easily able to judge, without danger to the patient, whether nature will assist itself in such cases without an operation. In 331 cases examined by the speaker with Röntgen rays 99 stones were found, some of which had even escaped the notice of the operating surgeon. The possibility of errors is, in a Röntgen ray examination, reduced to an average of 3 per cent.

Dr. COWL (Berlin) drew the attention of the meeting to the existence of at least some renal and ureteric calculi which must infallibly escape detection by X-rays: those consisting of nothing but uric acid, which latter is composed of elements of a low atomic weight. He agreed with Dr. Leonard as to the importance of the Röntgen ray method in this branch of medicine in 95 per cent. of cases examined.

Dr. CÆSAR COMAS (Barcelona) exhibited a number of excellent photographs, proving that he almost always succeeded in locating a stone in the kidney.

An important discussion followed, in the course of which Dr. HOLZKNECHT (Vienna) pointed out the possible danger to the patient as a result of the Röntgen ray examination.

Dr. ALBERS (Schönberg) corroborated this statement and mentioned several causes which might lead to these

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unsatisfactory results. Cases were cited in which the patient was operated on for stone when none existed. By the Röntgen rays it is, however, always possible to discover a stone the size of a pea, should the patient be not too obese. This mode of examination had proved generally most successful, but could not always be relied upon.

Dr. CRZELLITZER (Berlin) awakened great interest by his paper on "Recent Research on the Visibility of the Röntgen Rays." Contrary to the original statement by Röntgen, it has already previously been proved that the human retina is able to perceive the Röntgen rays as light. Various scientific men, among them the lecturer, have already found that the shape of the Röntgen ray fascicle (*e.g.*, round or square) has been recognised as such and projected accordingly. Now, as with certain blind persons the retina remains intact and blindness is only caused by opacity of the anterior portion of the eye, and as, in addition, this opacity, though impenetrable to rays of light, yet allows Röntgen rays to pass through, the possibility seemed to exist of procuring a certain degree of sight for such blind persons by means of leaden stencils suited to the case. It would, however, be imperative to make the Röntgen ray fascicle so small that it should only fall upon the yellow spot. The lecturer has made very careful experiments with particularly small platinum shades, proving that the centre of the retina, a spot of about 2·5 millimetres in diameter, remains blind to Röntgen rays. Therefore all attemps to enable the blind to read by means of Röntgen rays must remain impracticable.

Dr. COWL also is convinced of the perceptibility of Röntgen rays, but considers they do not exceed one-millionth candle-power.

Professor GREENMACH pointed out that these experiments of Dr. Crzellitzer deserved the greatest admiration, being extremely dangerous. The correctness of his deductions was demonstrated by photographs.

Dr. RIELINGER (Würzburg) spoke about the inflammation of the marrow of the bones in measles, which runs its course as the so-called Spinaventosa. This illness is mostly

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to be regarded as an infectious combination of acute juvenile illnesses and of tuberculosis, but may also arise independently, as has been proved in one case by Röntgen rays.

Professor LUDLOFF (Breslau) in his lecture touched upon a very important question, which, until the introduction of examination by Röntgen rays, had received but slight investigation, namely, the cause of severe pain in the loins after accidents. As it is difficult or well nigh impossible to discover any injury to the lumbar vertebræ by other means it was often wrongly concluded that the sufferer was imagining the pain. The Röntgen rays have often proved the existence of injuries, consisting of displacement and twisting of the lumbar vertebræ.

Dr. LEVY DORN (Berlin) stated some facts gathered during an experience of many years, and affirmed that in therapeutics it was necessary to take into consideration not only the intensity but also the volume of the Röntgen rays by determining the extent of the surface of the ray fascicle touching the skin of the patient. Cinematographic pictures showed the bones of the wrist, arm, and leg in movement. Some important cases were cited in which, by means of the fluorescent screen, distorted movements of the diaphragm had been brought to light.

Dr. ZONDEK (Berlin) cited a remarkable case, only discovered by the Röntgen rays, in which the formation of an aneurism had distinctly been caused by a vertebral exostosis.

Dr. KÖHLER (Wiesbaden), showing slides, spoke on the efficacy of the Röntgen rays in diagnosing the early stages of tuberculosis of the lungs in children between the ages of four and twelve. The caseated and calcined bronchial glands are thus almost invariably recognisable.

Dr. HENNECAET (Sedan), whilst recognising the importance of employing Röntgen rays in the detection of lung disease urged that the importance of the clinical diagnosis should not be overlooked. Radioscopy is usually much preferred to radiography when the necessary precautions are employed. The lecturer suggested the examination by Röntgen rays of pupils of large schools, recruits and persons wishing to insure their lives.

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Dr. BALSANOFF (Sofia), Dr. WEINBERGER (Vienna), and Professor WOLFF (Berlin) confirmed the importance of the use of Röntgen rays in all cases of tuberculosis of the lungs.

Dr. KATHOLICKY (Brünn) referred to a very strange case of bone softening (Paget's disease) in the tibia of an old woman, which brought about a considerable thickening and curvature of the leg, which was traceable to disintegration of the bone and formation of flesh bone deficient in calcareous matter. The fibula was normal and but slightly bent. Strange to say but slight inconvenience to the patient was caused by this great deformity.

* * *

At the evening sitting Staff-Surgeon RUMPEL (Berlin) exhibited a number of Röntgen photographs illustrating various forms of bone disease observed in the Bergman clinic.

Dr. JOACHIMSTAL (Berlin) demonstrated the satisfactory treatment by Röntgen rays, avoiding the use of the knife in cases of congenital hip disease.

Dr. PETER BADE (Hanover), speaking mostly on the same lines, laid stress on the fact that now, by the use of Röntgen rays, cases of so-called congenital hip disease have been proved to be merely dislocations which, if taken in hand before the twelfth year, may now be cured without operation.

Dr. STRÄTER (Aix-la-Chapelle) showed the use of the Röntgen rays as applied to the structure of the bones of the skull and the kidneys.

Some illustrated speeches not strictly dealing with medical science, closed the evening:

Dr. ALBERS (Schönberg) showed how the Röntgen rays had been useful in detecting spurious mummies.

Dr. STRASSMAN (Berlin) showed, by the Röntgen rays, various human freaks from the collection of the Pathological Museum at Berlin.

Professor EBERLEIN (Berlin) showed some results of the application of Röntgen rays in veterinary science.

Dr. FRÄNKEL (Nürnberg) spoke of the distorted feet of the Chinese women as examined by Röntgen rays.

(*To be continued.*)

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X-RAYS AND RINGWORM.

In the *Lancet* of June 24th, Dr. Adamson gives his experiences of the use of X-rays in the treatment of ringworm, worked out from his series of cases treated at Paddington Green Children's Hospital. He discusses the difficulties of treatment previous to the use of this method and the experiments that led to the recognition of what has proved to be the only rational treatment of this condition. He has followed Sabouraud's technique which has been previously referred to in this Journal. As the subject is one of great interest a full quotation from his article is appended :

"In my earlier experiments a series of cases were treated by means of repeated short exposures of ten minutes, ten to fourteen exposures spread over a period of from three to five weeks, and continued until the hair began to fall. In all cases the result was satisfactory and there was no dermatitis or permanent baldness ; the hair in each instance has grown again quite normally over the areas made bald by the rays. It is obvious, however, since we now know that the hair only begins to fall two weeks after the sufficient amount has been received, that the several applications during the two weeks previous to the fall of hair were unnecessary and might have been seriously harmful. The method, too, was tedious and suitable only for single patches or limited areas. At this time there were no means of measuring with accuracy the dosage of the rays ; the pastilles of Holzknecht were unobtainable in this country and, moreover, there was a tendency here to deprecate such methods of measurements. Better results were hoped for from the use of a specially constructed milliampèremeter by means of which the actual current being forced through the tubes could be measured. I undertook then another series of cases using a regulating tube and a milliampèremeter. By keeping the tube as nearly

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as possible at a fixed equivalent spark-length and the current, as registered by the milliampèremeter, at a fixed strength, I hoped to obtain rays of a constant quality and quantity, and it only remained then to fix the time of exposure. By making trials with gradually increasing doses I arrived at the following result—viz., that the least amount of rays necessary to produce depilation might be represented by the following factors :—primary current, 5 ampères; alternate spark-length of tube, 3 inches; current passing through tube, 4 milliampères; distance of anticathode from surface exposed, 6 inches; and time of exposure, 20 minutes. In this way I was able to produce depilation by one sitting of 20 minutes. But the results were not always quite satisfactory since it was found in practice impossible to keep all these factors constant. Sometimes depilation was incomplete and in one instance a slight radio-dermatitis was produced.

"With the use of Sabouraud's pastilles all these difficulties vanished, for experience soon showed that they indicate with remarkable accuracy the quantity and apparently also the quality of the rays emanating from the tube. By preliminary trial of the pastilles I was interested to find that with the ampèrage, spark-length of tube, and milliampèrage given above the time of exposure necessary to obtain the standard tint was exactly 20 minutes, thus corresponding with my own previous estimate. But when the tube was advanced to 4 or 5 inches alternate spark-length the time occupied was 10 or 12 minutes only. This was in accord with Sabouraud's statement that the higher the tube the more active the rays and consequently the shorter the exposure required; it was, however, opposed to the general view that soft tubes are more therapeutically active than hard tubes. One was naturally led to suppose that the change in the colour of the pastilles was not therefore necessarily a measure of the activity of the rays as regards the effect on the hair papillæ or of their capacity to produce dermatitis. But from my experience in the exposure of scalps by this method I am fully convinced that the change in tint of the pastille does afford an accurate measurement of the amount and quality

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of the rays. Indeed, I believe it to be at present the only safe means which we have of dosage for therapeutic purposes.

"With my own cases I have been accustomed to use a shield of lead foil with a hole corresponding to the area to be exposed placed on the patient's head. The head is fixed at the proper distance from the tube by means of a simple headrest attached to the chair back. The tube may be covered with a light composition shield in order to protect the operator, but the aperture through which the rays pass must be considerably larger than is usual in the shields in general use. The pastille is fixed at $3\frac{1}{2}$ inches from the anticathode (or centre of the tube) and this latter point at 7 inches from the scalp. A current of 5 ampères is passed through the primary circuit (the voltage is 24 units, part of which works the mercury interrupter). The tube is hardened by passing the current through the accessory bulb until it has an alternate spark of 4 inches. It is found that a current of about 0·3 milliampères is registered by the milliampèremeter in circuit with the tube itself. After ten minutes' exposure the pastille is examined and if not sufficiently dark it is replaced. The exposure usually under these conditions occupies from about 12 to 15 minutes. If the tube becomes softer, which is at once indicated by the galvanometer registering a greater milliampèrage through the tube, the exposure must be longer. With a tube of 1 inch and a milliampèrage of 1 milliampère it may even be as long as 35 minutes. But the pastille will indicate exactly when to cease the exposure. After the exposure nothing is done beyond the daily application of a weak ointment of ammoniated mercury with the view to prevent spreading when the hair begins to fall. This occurs with the utmost regularity *during* the third week after the application, beginning usually on the fourteenth day. If, however, the exposure has not been sufficiently long to produce the standard tint in the pastille, depilation will be incomplete, while if the pastille is made too dark by a too long exposure there is danger of subsequent dermatitis. A little practice enables one to recognise easily the proper tint.

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"In the treatment of cases where the whole scalp needs depilating I at first found great difficulty in adjusting the lead shield so that no two areas overlapped and that no untreated patches were left between the exposed areas. I have recently overcome this difficulty by using a light frame of very fine wire so as to divide the scalp into four areas—viz., the vertex, two lateral, and the occiput. The framework being adjusted the line of the wires is marked on the scalp with a skin pencil so that their position may be kept constant. It is then easy to surround each area to be exposed by sheets of lead foil folded round the wires. The frame is made simply of three pieces of wire, and is fixed by tying with tapes at the nape and across the forehead, thus dividing the scalp into four segments. Up to the present time I have treated 40 cases by Sabouraud's method, giving in all 100 exposures with the pastilles. In every instance the hair has fallen regularly and completely during the third week, leaving the surface quite bald and free from both diseased and healthy hairs. Many of these scalps have not yet had time to recover their growth of hair, but in those in which the defluvium took place more than six weeks ago the hair has begun to grow again and in all the earlier cases (both with and without the pastille) the hair-growth has attained its normal condition. In fact, my results are in accord with Sabouraud's statements that the hair begins to grow again six weeks after the defluvium is complete and that it is fully grown at the end of three months.

"Provided then that the proper precautions are taken—(1) that the length of exposure is not allowed to exceed the limit set by the right use of the pastille; (2) that no area or part of any surface is exposed more than once; and (3) that the part exposed is kept at the proper fixed distance from the anticathode of the tube—there is no danger of permanent baldness or injury to the tissues. At the same time care must be taken that the exposure is sufficiently long or the fall of hair will not be complete and many diseased stumps will be left behind, requiring needling or other treatment afterwards. When a part only of the scalp is being treated the remainder

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must be anointed frequently with a mild parasiticide or the falling hairs from the diseased patch will spread the disease elsewhere; this is explained by the fact that cultures of the fungus can be obtained from the depilated hairs showing that it has not been killed by the action of the rays."

MacLeod publishes his experiences with about sixty cases treated at Charing Cross Hospital and the Victoria Hospital for Children. As far as possible the method of Sabouraud and Noiré has been followed, but instead of a static machine he has used a 10-inch coil with mercury break, operated by current from a 100-volt continuous main supply. Regulating Müller tubes are used, and a d'Arsonval milliampèremeter inserted in the secondary circuit, between coil and tube. The tube is fixed on a metal stand and is protected by a lead glass shield with an opening, to the rim of which lead glass cylinders of different diameters are fitted. The current is kept at ½ milliampère by regulating the resistance in the primary circuit. The alternative spark gap is 4 inches Under these conditions the average time required for complete defluvium without causing more than a transient erythema proves to be 15 minutes. The results chronicled are eminently satisfactory and entirely bear out the experiences of Sabouraud and Noiré, an abstract of which we gave in a recent issue.—*Brit. Med. Journal*, July 1st, 1905. R.H.C.

The Treatment of Anal Fissure by High Frequency Currents.—This is a very lengthy paper by R. Marque, of Pau, in which every kind of treatment of this malady is discussed. He has found Doumer's method the most satisfactory and uses a conical glass electrode attached to an Oudin resonator. The patient is placed in the genu-pectoral position and the lubricated electrode introduced for a short distance. When the current is turned on the sphincters quickly relax allowing further introduction (the author considers 3 to 4 c.m. a sufficient distance). The current is passed for three to six minutes, using about 500 milliampères. Four to six treatments spread over a fortnight usually prove sufficient.—*Ann. d'Electrobiol. et de Radiol.*, Nos. 1 and 2, 1905. R.H.C.

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NOTES AND ABSTRACTS.

Ozæna treated by Finsen's Method.—Léopold uses a Strebel lamp with four carbons and conducts the cooled light into the nasal cavities through glass specula. After several applications the crusts and the disagreeable odour disappear, and in every case treated complete cure was obtained. He gives notes of seventeen patients, all of whom were cured, no recurrence being observed. No details are given as to dosage. It would seem doubtful whether the use of glass specula does not cut off some of the useful rays.—*Le Radium*, May 15th, 1905. R.H.C.

* * *

The Combination of Excision and of X-ray Treatment for Exophthalmic Goitre.—Carl Beck says that, although precise knowledge in regard to exophthalmic goitre is still lacking, the consensus of opinion among observers is that the condition is one of systematic intoxication dependent on deficient action of the thyroid gland. The results obtained by Kocher, who relieves the exalted vascularity of the region by ligation of the enlarged vessels, together with extirpation of one-half of the gland, are excellent but still leave much to be desired. The expected benefits do not follow in a considerable proportion of the cases, and in about three-quarters of all cases severe sequelæ are observed, such as a tendency to psychoses, increasing nervous excitability, facial congestion, palpitation, tremor, vomiting, fever, cold sweats, cyanosis, etc. The author's observations on the effect of the X-rays on new growths of the circulatory system led him to note their specific effect on the vessel walls and induced him to try their application for the relief of the extreme vascularity of this disease. In order to secure the greatest effect unilateral extirpation is an advisable preliminary, and the author mentions two cases in which radiotherapy produced very beneficial result over a year after the partial operation had been done with only partial relief of the symptoms. Another

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case is described at greater length, and in this the rays were employed about a week after the operation. The result was extremely gratifying, the tachycardia and dyspnœa promptly subsiding, so that a week later the pulse rate was only 80, the exophthalmos had almost completely subsided and the general condition was excellent. Some months later a perfect cure had been effected. Beck accordingly advises, for mild cases that have resisted internal therapy, general treatment combined with the X-rays, while in those of great severity unilateral extirpation should also be done.—*Berlin Klin. Woch.*, May 15th, 1905.—Görl also has tried radiotherapy in goitre, with what he considers very encouraging results. Seven cases were treated, and in all there was marked diminution in the size of the growth as well as improvement in the other symptoms. The author believes that it is primarily the parenchyma cells that are affected by the rays, and not the blood vessels, as the diminution in size of the gland begins so promptly and takes place so uniformly. Medium soft, or soft tubes were employed, and at a comparatively short distance from the skin. Care is necessary to prevent burns; in one case the author found that the patient's skin was unusually sensitive to the rays, and he suggests that this condition may be one of the symptoms of the disease.—*Münch. Med. Woch.*, May 16th, 1905. R.H.C.

* * *

Carcinoma of the Cervix treated successfully by X-rays.—Haret describes this case. The patient was sixty-five years old and had been refused an operation on account of her age and the invasion of the vaginal wall. Radiotherapy was tried with one sitting a week, the vagina being protected by a lead glass tube. After the sixth application not a trace of the primitive lesion could be seen or felt. The ulcerated parts were cicatrised. Haret considers that early treatment is an important factor in radiotherapy, and that at present too few cases are exposed to X-rays at the time when they would be of greatest service.—*La Presse Méd.*, May 13th, 1905.

R.H.C.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by REGINALD MORTON, M.D., *Secretary.*

The Thirty-first Ordinary Meeting of this Society was held at the Criterion Restaurant on Friday, June 23rd, 1905, at 7 p.m. The President, Dr. DONALD BAYNES, in the Chair. There were present 19 members and two visitors.

The minutes of the Thirtieth Ordinary Meeting and of the Special Meeting held on June 16th were read and duly confirmed.

The following was unanimously elected an ordinary member of the Society:—Chaworth Louis Nolan, M.B., B.Ch.Dublin, 7, Devonshire Terrace, W.

There being no other business the meeting then adjourned.

* * *

The Annual Dinner of the Society, which immediately followed the Ordinary Meeting, was attended by 19 members and 12 visitors. In proposing the toast of "The British Electrotherapeutic Society" the PRESIDENT referred to the work done by the Council during the past year in attempting to repress medical electrical treatment by unqualified persons, and hoped that their efforts would be more successful in the future. He deplored the fact that so many prominent members of the profession supported these "quacks," and read a circular in confirmation of his statement, in which the names of a large number of medical men were advertised as recommending an unqualified man who treated with light baths, "gout, obesity, rheumatism, lumbago, many forms of nervous troubles, cases of physical exhaustion, and general debility and sciatica."

Dr. LEWIS JONES, in responding to the toast, said that the efforts of the Society must be directed towards raising the

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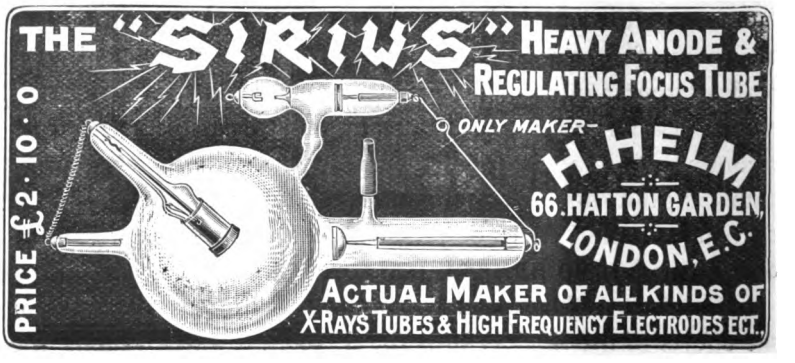
position of electrotherapeutics to a higher level. It was not sufficient to be able to give an electrical administration to a patient which was comforting and of use for neurasthenia or debility; but they must treat serious diseases successfully, and more successfully than they were treated in other ways. He referred to the Guy's Hospital circular, which was discussed in our issue for May.

Dr. SIBLEY then proposed "The Officers," response being made by the Secretary, Dr. MORTON.

In reply to the toast of "The Visitors," which was proposed by Mr. A. D. REID, Mr. DOUGLAS STORY recounted some of his recent experiences in the campaign in the Far East. He bore tribute to the excellence of the Japanese Ambulance Service, saying that one must consider the tremendous difficulties under which they laboured in respect of the distances traversed, and the enormous number of wounded to whom "first aid" had to be given at one time, amounting in some cases to hundreds of thousands!

Mr. ARTHUR EDMUNDS, whose name was also coupled with this toast, thought that the difficulty of contending with unqualified practice would be, and was being, gradually but surely overcome, as surgeons found that they got the most satisfactory and reliable work from the qualified man. He urged the most careful attention to skiagraphy, as that was of the highest importance to the surgeon.

The proceedings then terminated. R.H.C.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MEDICAL

Electrology and Radiology.

No. 8. AUGUST, 1905. VOL. VI.

EDITORIAL.

The first Provincial Meeting of the British Electrotherapeutic Society, which was held at Leicester on July 26th, 27th and 28th, proved to be very successful. An excellent selection of papers were read and the attendance of the members was good. The discussions which followed the papers were most interesting. These discussions with the papers will be reproduced in full in the Journal. The meeting reflects great credit on the energy of the President and Secretary, to whose efforts the success of the undertaking is mainly due. We hope that the Annual Provincial Meeting will become an established feature of the Society's work, and its inauguration under such good auspices should be encouraging to those who have promoted it and to those who may have to do so in the future.

* * *

The Medical Supply Association are showing the latest form of Mercury Jet Interrupter, which is that of Messrs. Gaiffe. It possesses certain decided advantages, being cheap, portable, and so simplified that it dispenses with the independent motor usually necessary to a turbine break. This interrupter works on continuous current at any voltage from 12 to 250, with very little change in its regulation. Saving is effected in current also, as the break is connected not in shunt but in series. The dielectric is alcohol. R.H.C.

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THE TREATMENT OF URETHRAL STRICTURES BY ELECTROLYSIS.

By T. J. Bokenham, L.R.C.P., M.R.C.S.

In bringing this subject before our Society, I feel I ought to preface my remarks by a brief survey of what has already been done in this country and abroad as regards the employment of electrical measures for the relief of stricture of the urethra.

First of all I wish to point out that the root idea is far from being novel, it was employed as long as 15 to 20 years back by the late Dr. Steavenson, when medical officer in charge of the electrical department at St. Bartholomew's Hospital, and I understand that in his hands it gave more or less satisfactory results. Later on attention was again directed to electrolytic methods by Bruce Clarke, who I believe obtained some very satisfactory results at the time. But for some reason or other, the practice seems to have in this country fallen into disuse, and at the present time, like many other forms of electrical treatment, is either unknown or but little regarded by most of our surgeons. In France and America, however, electrolysis has made a far more favourable impression on the profession, and in the latter country especially, the technique of such treatment has been very carefully worked and extensively adopted; probably this is due in great measure to the skill and large experience of the late and highly esteemed Dr Robert Newman, of New York, who may truly be regarded as the "father" of the method. In the year 1902, this writer (Advanced Therapeutics, Vol. XX, p. 54), stated that he had successfully used his method of electrolysis in the treatment of strictures in about 2,000 cases, while seven years previously he had published a compilation of 1,755 successful cases in the practice of 54 different operators, mentioning their names, and also the favourable opinions they had expressed concerning their results. "Many of these patients have been kept under observation, have been re-examined after years, and no relapse

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followed. During these years no single patient suffered from a return of stricture in the same place which had been cured by electrolysis, nor did the writer lose a single case by death while under the treatment."

Even nowadays the strongest advocates of urethrotomy cannot promise a cure, and a patient once operated upon will probably remain a patient for the rest of his life. "Other methods may cure certain strictures which are simply contractions within the urethra, but it has not been proved that fibrous pathological conditions of induration, invading tissues outside the urethra, and even the corpora cavernosa and spongiosum, can be removed by cutting, divulsion or dilatation."

So far as I am aware, nobody has questioned the genuineness or accuracy of Dr. Newman's results, and I must admit that my own small experience has led me to accept his statements, as to the value of his method when properly applied, without the least hesitation.

I am of opinion that the great majority of failures which have been reported should be ascribed to one or more of the following causes :—

(*a*) Faulty diagnosis.

(*b*) Attempts made while inflammation, discharge, or excoriation, is present.

(*c*) Faulty instruments and technique.

(*d*) Lack of patience or of electrical knowledge, resulting in local cauterization (too strong currents), instead of gentle diffused electrolysis.

There may be other reasons, but the above are probably the most important.

Electrolysis—as to the efficiency of which I have already declared my personal conviction—has also in its favour the facts that it requires neither general nor local anæsthetics, that the patient is not kept in bed, and that the treatment involves no interference with his ordinary avocations. This last is a question of no small moment to business men.

Considering for a moment the anatomical features of a true stricture, we find in most cases that there has been more

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or less deep-seated infiltration of the sub-mucous tissues surrounding the urethra, leading to fibrous formations and cicatrices, which gradually diminish the calibre of the urethra. Such being the conditions, there is no doubt that a gradual dilatation will afford a temporary mechanical relief, but it can have little action in promoting the absorption of the infiltration which is the cause of the constriction, and before long the trouble will certainly recur.

In the electrolytic method we aim at something more thorough than a cure of the simple contraction of mucous lining. Our object is to produce a softening and absorption of the deeper infiltrated tissue without causing damage to the mucous lining by either mechanical dilatition or caustic action. We must get our results not by local cauterization, but by electrolysis or "ionization." In order to secure such results we must adhere to the following rules:—

(1) Select electrodes of suitable size and form.

(2) Make a thorough preliminary study of the topography of the urethra, measuring each stricture so as to know exactly what is necessary, and to make definite plans for future guidance.

(3) An electrode of about two or three numbers (French) larger than the stricture will admit, is to be introduced until its extremity is arrested by the narrowing. This electrode is to be attached to the negative side of the electric source, the circuit being completed by a moistened positive pad applied to some indifferent part of the patient.

(4) The current is then to be very gradually turned on, the end of the urethral electrode being gently, and without any pressure, kept in contact with the stricture. In no case should the current excede 5 m.a., while 2½ m.a. is often ample.

(5) After a time, which may vary from 5 to 20 minutes, the electrode will be found to slip easily, and without any force through the stricture.

(6) The forward progress should not be arrested until the electrode has in the same manner passed through the whole length of the urethra and entered the bladder. It must then be gently withdrawn, the current being still on, and slight

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pauses made at the site of each obstruction until the most peripheral one has been passed once more; the current is then to be gradually reduced to zero, and the electrode entirely withdrawn.

(7) No pain should be caused at any stage of the treatment, nor is the least force permissible. Electricity, and that alone, must be relied on to do the work.

(8) On withdrawing the electrode the patient should be asked to micturate, when the altered character of the stream will generally astonish him.

(9) No attempt must be made to pass a second larger bougie at a single sitting. Any such undue eagerness is likely to defeat its own ends and to retard ultimate progress.

(10) Treatment must not be repeated at shorter intervals than a week, and on each successive occasion the electrode may be one or two numbers larger than that used at the preceding sitting.

To quote once more from Dr. Newman's own writings :— "Under no circumstance must pressure be used. . . . The stricture yields, is enlarged, the electrode slowly advances, passes the obstruction, and sometimes will fairly jump through the stricture."

Mr. Bokenham passed round for inspection specimens of the electrodes employed. These were of three kinds, all of them rigid, viz. :—

(*a*) The Egg-shaped set, with short curve, ovoid metallic bulb at the working end, with a round wire at the other end for attachment to the cord from the negative pole. The rest of the electrode must be well insulated with hard baked-on rubber, smooth and free from inequalities. The sizes of this set, used in all ordinary cases, are 11, 14, 17, 18, 20, 21, 23 and 25 (French).

(*b*) The Acorn set. These are similar in construction, but short and straight, the bulb being acorn shaped, and the sizes running from 15 to 25 (French). This form is best for use in enterior strictures, and does most service during its gradual withdrawal, when one can feel best how much work should be done.

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(*c*) The Tunnelled set, to be used for bad, tortuous strictures. The sizes are Nos. 9, 11, 14, 17, 20, 21 (French). The curve is shorter, and the egg-shaped bulb tunnelled, so that it may be introduced over a filiform guide. With a tortuous stricture these electrodes are safer, and it is quite impossible to make false passages. Their use, however, requires considerable practice and should not be attempted by the beginner. These electrodes are, I fear, not to be had in this country. I had to get mine direct from New York (Tiemann & Co.).

In conclusion, I need only say that my own experience leads me to think very highly of the method as above advocated, and my object will have been entirely gained *if* these few words should induce other members of our society to give "Newman's Method" a fair and careful trial.

* * *

In the discussion which followed, Dr. LEWIS JONES said: "I should like to say that it is very interesting to me to hear Mr. Bokenham's communication upon the electrolysis of stricture. About 15 years ago the treatment of stricture by electrolysis excited a considerable amount of interest in this country, and papers were read by Mr. Bruce Clarke, by Dr. Steavenson, and by other surgeons, upon this subject. Since that time the method has fallen into disuse in this country, and I do not know whether any one now practises it at all systematically. Abroad, more interest is still taken in it, and papers have appeared from time to time in the foreign Journals, which show that the electrolysis of stricture is not entirely abandoned. I believe its disuse in this country is due to the fact that good results can be got by simpler methods."

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THE RÖNTGEN CONGRESS IN BERLIN, 1905.

TUESDAY, MAY 2nd.

(Continued from page 167.)

The second day of the Congress was devoted to papers of a physico-technical nature, which mostly only appealed to the expert and occasionally called forth disputes as to the priority of an invention.

Professor WERTHEIM-SALOMONSON (Amsterdam) spoke about his investigations into the output of the induction coil by means of which he has measured its mechanical efficiency.

Dr. WALTER (Hamburg) spoke on the different modes of procedure in the measurement of the intensity of the Röntgen rays, concluding with a demonstration of a combination of Dr. Holzknecht's method with the milliampèremeter.

Dr. KIENBOCK (Vienna), whilst insisting on the importance for the therapeutic use of the Röntgen rays of measurements of intensity, gave decided preference to the so-called direct measurements as opposed to the indirect.

Dr. KOWALSKI (Freiburg, Switzerland) proposed that a commission of physicists, doctors and electricians be appointed to determine a universal unit for the measurement of the intensity of the Röntgen rays. The proposal, though deemed premature by some experts, was adopted by the Congress.

Dr. HOLZKNECHT (Vienna) spoke on the dosage of the Röntgen rays, a difficult and important question, because the intensity of the rays given off from an X-ray tube shows great fluctuation as opposed to the constant output of radium and Finsen light. The invention of an instrument which will produce a graphic record of the curve of intensity of each focus tube is desirable.

Dr. GOCHT (Halle), speaking about X-ray tubes, recommended the employment of a platinum mirror and the use of hemispheric anticathodes, but opposed the use of adjustable cathodes.

Professor GRUNMACH demonstrated with his vacuum apparatus, which is characterised by a double tubular dia-

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phragm in front of the anticathode as well as by an adaptable vacuum. His method of localisation was shown in connection with these tubes. This, by means of cogwheels and numerous screws, is accurately adjusted to the human body in various positions.

Dr. ROSENTHAL (Munich) described the physical principles of a new accessory apparatus for the reduction of dislocations and for determining foreign substances in the human body. He also described a Röntgen apparatus which is of great efficiency, yet simple to handle and showed radiographs of parts of the lungs of a man of thirty years of age, taken with a record exposure of only one-tenth of a second, which defined the condition of the lungs most distinctly.

Dr. B. ALEXANDER (Kesmark) demonstrated by 120 skiagrams the development of the bones of the hand from the earliest osteogenesis, showing where this commences and the course it takes. The bone formation during interuterine life of the child was minutely followed, and then the further development of the bones after birth.

Mr. DESSAUER, Engineer (Aschaffenburg), discussed the aims of Röntgen technique with special regard to the composition of the rays. It was of the utmost importance in therapeutics to effect the correct selection of the rays. The main object to effect in the construction of instruments for therapeutic use was to obtain Röntgen apparatus with flat curves of discharge, which would necessitate a marked deviation from the various apparatus now in use.

Dr. PASCHE (Berne) treated of the exclusion of the secondary rays by a system of movable diaphragms, and explained the theory of a new apparatus which applied the existing system to new spheres of action. Whilst with the old method of limiting the exposure to a very small area only comparatively small radiographs were obtainable, especially when sharpness of outline was required, with the new method it will be possible to obtain radiographs of the greatest clearness in any size desired.

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In the afternoon sitting Dr. MAX LEVY (Berlin) reported on remarkable improvements in Röntgen technique. The first part of his lecture dealt with protective apparatus against the ill-effects of the Röntgen rays. The lecturer chiefly uses a flexible, elastic and washable material, such as rubber or soft leather, with a coating of a mixture of a heavy metal salt and rubber or some similar substance. This protective material can be used for all possible purposes, such as tube diaphragms, face masks, caps for the hair, beard protectors, gloves, aprons and screens behind which the doctor conducts his operations from a window. A model clad in this protective material was shown. Then a new principle of interruption, the friction break, was described. A horizontally rotating wheel by friction rotates a second vertical wheel, the lower end of the latter dips into mercury and is grooved. By means of this grooving small portions of the mercury adhere to the surface of the second wheel and are transmitted to the point of contact, thus making and breaking the current.

A new means of working Röntgen tubes by high tension alternating current without interrupter or condenser was discussed. By this means rotating parts and electrolytic cells were completely avoided and the high tension alternating current conducted direct into normally constructed Röntgen tubes by the interposition of a so-called current-sifter. The current-sifter consists of two simple spark gaps, by means of which one phase of the alternating current is conducted to earth. The quantity of current used is so small that the new process recommends itself not only for alternating but also for constant current.

Mr. FRANZ KOCH, Engineer (Dresden), exhibited a transformer with automatic rectifier. Reversals of current are removed by a Grätz cell which only undergoes slight deterioration. The apparatus works without interrupter, noise, or movable part. The lecturer also explained a new high tension tube which does not heat by use and, therefore, retains its efficiency for a long time.

Dr. WICHMANN (Hamburg) exhibited a new focus tube which only permits the emission of the rays required, thus

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protecting both patient and doctor from the injurious effects of the rays. By a further contrivance the curative properties of the rays can be applied to deep-seated diseases.

The PRESIDENT announced that the Council of the Röntgen Association, together with other members of the Congress, had resolved to found a German Röntgen Society. It was intended to make a permanent institution of the Röntgen Congress, to meet every three years. The following resolution was put to the Congress:

"On this day (May 2nd, 1905) the German Röntgen Society has been founded by the undersigned. The business of the Society will be carried on *pro tem.* by the Council of the Berlin Röntgen Association. The Council is empowered to draw up suitable rules. Members of the Congress now being held in Berlin are invited to become members of the Society."

Professor WERTHEIM-SALOMONSON (Amsterdam) expressed a fear lest future Congresses of the German Röntgen Society should enter into conflict with the International Congresses for Medical Electrology and Radiology, the third of which had already been postponed because of the Röntgen Congress then sitting.

This objection was removed by the PRESIDENT, who stated that the new Röntgen Society was to be a German institution, which later could be incorporated with the International Association, and moved a vote of thanks to Professor WERTHEIM, as President of the Third International Congress, for the consideration extended to the Röntgen Congress. No effort would be spared to ensure the hearty co-operation of the Associations. The resolution was passed with acclamation.

Dr. ALBERS (Schönberg) then announced that the Special Commission appointed by the Congress to institute a uniform nomenclature had met and proposed the following terms for general acceptance:

Röntgenologie:	The science of the Röntgen rays.
Röntgenwissenschaft:	
Röntgenoscopy:	Radioscopy.

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Röntgenography:	Röntgen photography.
Röntgenogram:	Skiagram.
Röntgentherapy:	Röntgen treatment.
Röntgenize:	To treat with Röntgen rays.

M. GRISSON (Dresden) explained his resonator.*

Dr. GRASHEY (Munich) exhibited an apparatus which allows of the surrounding of parts of the body by the focus tube, and thus allows fractures or the position of foreign bodies to be ascertained without moving the injured body.

Drs. ROBINSOHN and WERNDORFF (Vienna) reported a new process by means of which details of the soft parts of the joints hitherto not visible have been defined. This process consists of the injection of chemically pure oxygen into the joints. Radiographs were shown of chronic joint diseases, tuberculosis, congenital malformation of the joints which, in contrast to former radiographs (which only showed the outlines of the bones), defined clearly all the ligaments, synovial membranes and cartilages.

In the resulting discussion Dr. PERTZ (Carlsruhe) maintained that this injection would be dangerous on account of infection, while other surgeons considered this risk insignificant.

Drs. FAULHABER (Würzburg) and HEINZ-DAUER (Berlin) exhibited several forms of apparatus for the improvement of Röntgen technique.

(Concluded.)

* Discussed in our June issue.—R.H.C.

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NOTES AND ABSTRACTS.

Treatment of Goitre by X-rays.—Two cases are described by Stegman. The first was that of a woman of 52, who was being treated by X-rays for enlarged supraclavicular glands after removal of the left breast for carcinoma. At the same time a parenchymatous goitre of considerable size was exposed to the action of the rays. After the sixth application the enlarged glands could no longer be palpated, and the goitre had been diminished in size by about one quarter of its volume. The second patient was a girl of 21, with a large soft parenchymatous goitre. After only two exposures the circumference of the neck decreased from 39.8 centimetres to 36 centimetres, and the previously existing dyspnœa was relieved.—*Münch. Med. Woch.*, June 27th, 1905.

* * *

The Therapeutic Use of the X-ray.—W. A. Pusey gives the results of his later experience with the X-ray. In some disorders, such as hypertrichosis and lupus erythematosus, the results have not equaled expectations ; in some others, such as tubercular glands and joints and deep sinuses, the results have been variable, though with some marked successes. The value of the X-rays has been most markedly demonstrated in sycosis, tinea, acne rosacea, lupus vulgaris, blastomycosis, cutaneous carcinomata, and senile keratosis. The value of the X-ray has also been shown in hyperidrosis, inflammatory dermatoses, pruritus, nævi, keloid, sarcoma, and as a prophylactic after operation for malignant disease. In some other conditions, abdominal tuberculosis, actinomycosis, mixed tumours of the parotid, there has been apparent benefit from the X-rays, but Pusey does not feel inclined, from his experience, to make any very positive generalisations. In the deeper situated cancers, as might be expected, the treatment is less hopeful, though palliation may be hoped for and some surprisingly good results are reported. In conclusion, Dr. Pusey gives his latest experience with pseudoleucæmia, leucæmia, and goitre. In the former he has repeatedly seen

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clearing up of the glands, but in the only case he has been able to follow up there have been repeated recurrences. In true leucæmia he has seen like good effects as regards disappearance of the enlarged glands, but generally without any corresponding improvement in the condition of the blood. One remarkably successful apparent cure is reported, the blood examination revealing normal conditions and the patient apparently well. In some small parenchymatous goitres he has seen reduction in size of the tumour, but in most of his cases no benefit was observed.—*Journal of the American Medical Association,* May 13th, 1905.

* * *

Tuberculous Cervical Adenitis Favourably Treated by the X-rays.—Jean Ferrand and Krouchkoll, in describing this case, state that they were among the first to use the X-ray in cases of tuberculous cervical adenitis. Before publishing this case, they have allowed nearly a year to pass since the beginning of the treatment, in order to prove the persistence of the good results. The patient has been out of the hospital for five months, and she has been able to resume her work. The older treatment by arsenic and iodides was instituted at first, after the diagnosis had been made, but was not followed by recovery. The first treatment by X-rays was given on August 20th, 1904, and the writers observed the improvement from day to day after this treatment was begun. One of them also treated other cases of this disease in the same manner, and the result has always been favourable. Even two cases of suppurative adenitis have improved under the X-ray. In the patient here reported, the cervical tumours have been completely transformed. The writers think that hard tubes should be employed; the sittings should be short—ten minutes for the maximum. The treatment should be interrupted if pigmentation appears. They believe that this treatment should be tried in all cases of chronic tuberculous adenitis, for all other methods, both medical and surgical, are uncertain.—*Gazette des Hôpitaux Civils et Militaires,* June 20th, 1905.

* * *

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Treatment of Noma by Red Light.—Motchane has made use of this method in a boy of nine, who had suffered successively from scarlatina, varicella, rubeola, double pneumonia, and otitis media. He had then a double perforation of the cheek and lip occurring on the twentieth day of an attack of noma. The treatment was carried out by means of a 16 c.p. lamp covered with red glass, the rays being concentrated on to the lesions by means of a conical reflector. The light was applied uninterruptedly for three days, when the pain ceased but reappeared when the lamp was placed further away than the original distance, 25 cm. The wounds appeared then fairly healthy. A fortnight later cicatrisation was complete and the boy was discharged cured. No other local therapeusis was practised in this case, and the writer considers the cure due solely to the rays employed.—*Ann. de Méd. et Chir. Infantiles*, July 1st, 1905. R.H.C.

NOTICES OF BOOKS.

RADIOTHERAPY AND PHOTOTHERAPY, INCLUDING RADIUM AND HIGH FREQUENCY CURRENTS. By Charles Warrenne Allen, M.D. Published by Henry Kimpton. 1 vol. 8vo., pp. 618, with 131 illustrations and 27 plates. 22/6 net.

Out of the many publications on these subjects which have been issued during the past year, this treatise is certainly one of the most complete from the point of view of the medical practitioner. Unlike most of its predecessors it deals very little with the physics of the subject, but is almost entirely devoted to the diagnosis and treatment of disease by electrical methods. Accuracy of dosage, we are glad to find, is insisted upon, and the latest methods of securing this most desirable end are explained in detail. The section on radiography is good; the author aims at shortening exposures as far as possible. The X-ray treatment of skin diseases is well discussed and we find careful instructions as to the use of the rays in ophthalmological and oto-laryngological practice. The type is large and clear, though the book is somewhat weighty.

We can cordially recommend this work to all interested in electrotherapeutics.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by REGINALD MORTON, M.D., *Secretary.*

A Provincial Meeting of the British Electrotherapeutic Society was held in the Library of the Y.M.C.A. Building, Leicester, on Wednesday, July 26th, 1905, at 10.30 a.m. The President, Dr. DONALD BAYNES, in the Chair. There were present 20 members and two visitors.

The minutes of the Thirty-first Ordinary Meeting were read and confirmed.

Dr. H. LEWIS JONES opened a discussion on "The Present Position of the Treatment of Carcinoma and Sarcoma by Electrical Methods." Dr. Jones brought two cases from London to illustrate his remarks, which, with the subsequent discussion, in which Messrs. Chisholm Williams, T. J. Bokenham, Hall-Edwards, E. H. Nash, E. S. Worrall, and the Secretary took part, will be published in this journal.

Mr. T. J. BOKENHAM then gave an address on "The Treatment of Stricture of the Urethra by Electrolysis," showing some new forms of instruments for this purpose.

His remarks were briefly discussed by Dr. Lewis Jones and the President.

The meeting then adjourned to 10.30 a.m. on July 27th, when Mr. J. HALL-EDWARDS read a paper on "X-Ray Dermatitis," showing various protective devices, including a new one by Dr. Belot, of Paris. An interesting discussion took place, in which Drs. Lewis Jones, G. H. Graham, D. Arthur, E. S. Worrall and the President took part. Mr. Hall-Edwards replied.

The Secretary—on behalf of Dr. J. ALLAN, of Chislehurst—showed a tooth-brush extracted by him from the stomach of a patient, 50 hours after it had been swallowed during a fit of temporary insanity, with a view to suicide. The radiograph, which accompanied the specimen, showed the position of the brush very satisfactorily and the action of the gastric juice on the brush was very pronounced.

Dr. G. H. GRAHAM read a paper on "Aesculin in Con-

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junction with Finsen Light in the Treatment of Lupus Vulgaris." Dr. Lewis Jones and Mr. J. Hall-Edwards took part in the discussion.

Dr. STANLEY GREEN read a paper on "The Diagnosis of early Tuberculosis of the Lung by X-ray Examination of the Chest," which was illustrated by a very interesting series of lantern slides prepared from radiographs of patients he had had under his care. Discussion—Mr. Hall-Edwards, Dr. Lewis Jones, the President and Dr. Arthur, to which Dr. Stanley Green replied.

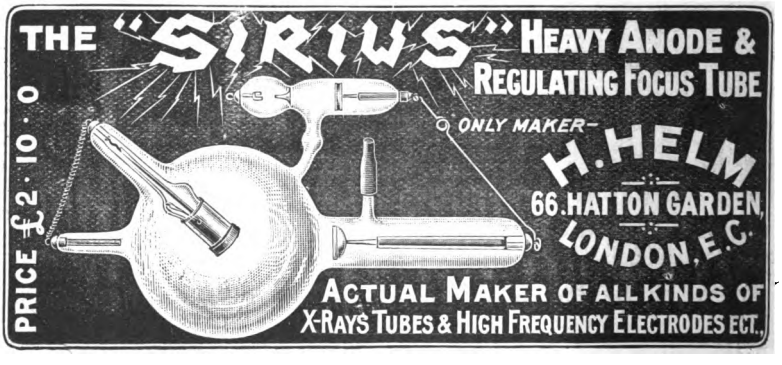
The meeting then adjourned until Friday, July 28th, 1905, at 10.30 a.m., when Mr. A. D. REID described and showed a new combined X-ray and High Frequency Couch. This was very favourably criticised by the President, Drs. Lewis Jones and Morton.

Dr. LEWIS JONES read a further note on "The Use of the Milliampèremeter as a Measure of X-ray Production," illustrated by a series of lantern slides. Discussion—J. Hall-Edwards, A. D. Reid, Dr. Bruce, J. A. Codd, and the President. Dr. Lewis Jones replied.

Dr. H. MCCLURE opened a discussion on "The Influence of Electrical Treatment on Blood Pressure and Body Temperature," in which Drs. J. Elliott, Ironside Bruce, Lewis Jones, A. D. Reid, and R. Morton took part.

Dr. LEWIS JONES took the chair while the President, Dr. Donald Baynes, read his paper on "Neurasthenia." A brief discussion followed.

The meeting then closed.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MEDICAL

Electrology and Radiology.

No. 9. SEPTEMBER, 1905. Vol. VI.

EDITORIAL.

In the section of Ophthalmology at the meeting of the British Medical Association held at Leicester in July, Mr. Bishop Harman gave his experience of the treatment of trachoma by electrical methods. His remarks were based on four cases treated with X-rays, seven cases with high frequency currents, and two with radium. With regard to the X-rays he explained that there were two sets of rays emanating from the tube, namely, the X-rays proper and the overflow rays, which, he says, are responsible for the burns which sometimes occurred after exposure, and states that the former rays were used.

This classification may be new to some of our readers, and it would be extremely interesting to all to know how these overflow rays were prevented from acting while the X-rays proper were utilised. If this is a fact the danger of X-ray treatment to patient and operator should be a negligible quantity, which up to the present, unfortunately, it cannot be considered to be. Of the cases treated with X-rays, one had 50 applications during five months and no marked improvement took place in one eye, whereas the other became worse. The other three cases did no better. The cases treated with high frequency currents did not improve at all. Prolonged application of radium in two cases caused no amelioration of the condition. In the report in the *British Medical Journal* no details of treatment are given.

The X-ray treatment of trachoma was originated by Mr. Mayou in 1903, and in the majority of his cases marked improvement took place, although the very chronic cases proved more or less intractable. Mr. Harman stated that the pain was not relieved in his cases. This has not been our experience, and it is possible that some difference in technique may account for these discrepancies. We agree that the use of the high frequency currents has not been attended with success. It would be interesting if any of our readers who have had experience of this mode of treatment would communicate their results, which we should be glad to publish in a subsequent number.

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X-RAY DERMATITIS: ITS CAUSE, TREATMENT AND PREVENTION.

By J. HALL-EDWARDS, L.R.C.P.

(General Hospital, Birmingham.)

Speaking from the point of view of the medical man, no discovery in pure physics has placed at our disposal such a power for good as has accrued from the application of the X-rays to diagnosis and treatment. Although much has been done in the ten years which have passed since Professor Röntgen gave to the world one of the most startling discoveries of the nineteenth century, we must all admit that to a very great extent we are still working in the dark, and that much has to be learned before we shall be able to acknowledge that we are using this potent agent to the best advantage. Whilst (working under present conditions) we can to an extent realise the possibilities and impossibilities of the agency in question, we can draw no hard-and-fast line, and we must be prepared to alter our views at any moment. The introduction of a new apparatus for generating high tension currents, such as we require for exciting an X-ray tube, improvements in the manufacture of tubes, or the discovery of some new method of producing the rays, may at any time place us in a position for applying them in a more efficient manner, and with such an altered effect that our present views (or at any rate some of them) may have to be abandoned at a moment's notice. It would be foolish to attempt to predict the ultimate results of the application of the X-rays, but it may be taken for granted that they have a future far more brilliant than has already been achieved, and that their usefulness must become greater.

When, in the very early days of the discovery, I attempted to predict a future for the rays, which fell far short of what has already been accomplished, I was laughed at; but, despite opinions which differed very widely from mine, I gave up general practice and started as an X-ray expert. I believe I was the first medical man in this country to take this step, and I do not regret it, notwithstanding the fact that my enthusiasm and lack of knowledge landed me into acquiring a chronic disease, which has to a very great extent rendered my life during the last four years a misery to me.

At last year's Annual Meeting of the British Medical Association at Oxford, before the section devoted to Dermatology (there being no section devoted to Electrotherapeutics), I read a paper on "Chronic X-ray Dermatitis," which was well received, but which was only imperfectly discussed owing to the fact that there was unlimited material and limited time. I then expressed the opinion that in the face of existing

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knowledge there was little or no danger to new workers who took proper precautions to protect themselves from the deleterious effects of the rays. I mention the operators first, because whilst the patients are individually only exposed for a very short time, the surgeons in charge of the cases are hourly and daily exposed to the rays at a risk of injuring themselves for life.

My chief reason for again inflicting upon you a paper on the same subject is to point out and describe the various methods of protecting both patients and operators in an efficient manner.

It is a curious fact, and I may say an axiom, that any therapeutic agent which is capable of producing good results is also capable of producing harmful ones. Indeed, it may be said that an agent which, administered wrongly, cannot produce ill results, cannot produce good ones, no matter how it is administered. In the scientific administration of harmful therapeutic agents, results are obtained which could never be achieved by the giving of drugs which produce no effect, good, bad or indifferent.

I lay stress upon this fact because it teaches a moral lesson which may prove useful in the application of other agents which come within the scope of Electrotherapeutics.

The production of dermatitis by the application of the X-rays was, in the first instance, observed as the result of wrongful administration. This was due to ignorance on our part of the properties of the agent we were using.

Personally, I may say, that in the early days the only X-ray dermatitis I produced came home to myself, but I freely admit that in the light of our present knowledge I often wonder how it was that I escaped killing several kind friends who volunteered to render me assistance by allowing me (at great personal inconvenience) to radiograph them. Indeed, it is a wonder that I am not now breaking stones at Portland instead of being free to inflict these observations upon you. Eight years ago I gave many exposures (with a Jackson tube) of over an hour's duration with the tube fixed within 2 or 3 inches from the unprotected skin, using a coil capable of giving a 15-inch spark through the primary of which 8 ampères of current, at a pressure 12 volts, passed. With our modern tubes such an exposure would, or rather should, render the giver liable to criminal prosecution ; yet only a few months since my attention was drawn to a case of severe dermatitis due to the giving of such an exposure.

In 1898 (as the result of reading of a large number of cases in which accidental X-ray burns had been produced), it occurred to me to try the effects of the rays in cases in which destruction or removal (by operative proceedure) of superficial lesions, was indicated. From these experiments (the

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results of which I have already published) I learned much; and I must admit that in two instances the results achieved were all that could be wished for, although the subsequent treatment of the cases involved an amount of work and anxiety which one would not undertake without consideration, not only from the point of view of the operator, but from that of the patient, who suffered considerable pain for a lengthy period.

It is generally recognised now that the production of a limited dermatitis is necessary for successful treatment, and one of the objects of this paper is to show how this can be achieved without risk to the operator or patient.

X-ray dermatitis is from experience divided into two classes: "acute" and "chronic." These differ widely from one another, the acute form being nearly always produced upon patients, whilst the chronic form is only seen upon operators. I have never yet seen a case of chronic dermatitis upon a patient, although some have undergone a very large number of exposures. An acute dermatitis may be produced upon any portion of the body, whilst the chronic form has, as far as I can make out, never been seen anywhere but upon the hands. It does not follow from this statement that the chronic form cannot be produced anywhere, and it may be that in some rare instances a chronic X-ray dermatitis has been produced elsewhere. The reason why chronic X-ray dermatitis only appears upon the hands is obvious, viz., that if unprotected they receive the most constant and intense radiations. No other portion of the body is ever placed so constantly or so near the tube.

Acute X-ray Dermatitis arises as the result of too-prolonged or too-frequently repeated exposures within a limited space of time. A result which may culminate in the death of the patient could be achieved in one sitting.

An acute X-ray dermatitis can be produced upon anyone, notwithstanding the fact (and I think one may take it as a fact) that idiosyncrasy plays an important part in its production. I would here like to lay stress upon this point, because later on I hope to show that no means of measuring the rays can possibly place at our disposal a method of administration which will apply equally to all and everyone who comes to us for treatment.

It has been said by some writers upon the subject that an acute X-ray dermatitis may show itself during, or immediately after, a prolonged exposure to intense radiation. This I have never seen, neither have I seen any results accrue (for no matter how lengthy the exposure) within a period of from seven to twenty-one days after radiation. Freund gives the time in which the hairs fall out after a strong radiation as varying from three to fourteen days. As hair, however, can

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be removed without the production of a severe dermatitis, which need not necessarily produce the results of an ordinary burn of the second degree, it does not cover the whole field of X-ray burns which I wish to include in my category.

The X-rays act very differently upon normal and diseased surfaces. In cases of lupus, for instance, the reaction of a prolonged exposure produces very different effects from those which would be obtained upon normal skin, moreover their effects differ in different diseases. In rodent ulcer I have never yet produced such a severe reaction as has been repeatedly produced in lupus with the same intensity of radiation.

The pathological changes in the superficial tissues which follow an exposure to the X-rays have been described by various observers as presenting such a variety of clinical appearances that one becomes bewildered. I will therefore accept only those which are obvious to all, and refrain from entering into a pathological discussion, which might occupy more time than I have at my disposal.

The effects noticed after an abnormal exposure, and which make their appearance at a variable interval afterwards, are tingling, itching, turgescence, the production of pigment, redness, increased temperature, shedding of hair, smarting and burning. The parts may become inflamed and exceedingly painful, and may ultimately slough and produce an ulcer, which is not only exceedingly painful but difficult to heal. This ulcer may only be superficial, or it may involve the whole thickness of the skin and some of the tissues beneath. If such an ulcer is deep enough to have passed through the skin, it sooner or later (unless the most stringent precautions be taken to prevent it) assumes chronic characteristics which point to its method of production. The surface becomes covered by an exceedingly tough and adherent wash-leather coloured deposit, which is most difficult to remove, the slightest touch upon the surface of which produces the most intense pain. The difficulty of removing this leathery deposit is so great that in two cases under my care I have administered an anæsthetic and applied acid nitrate of mercury over the whole surface. After such an application a slough separates in a week or two, and if great care be taken a healthy granulating surface may take its place. The pain experienced from the ulcer is great, and nothing appears to entirely relieve it. Exclusion of air, however, renders the sore much more bearable. In a series of four cases (in none of which the ulcer exceeded 2 inches in diameter), over twelve months' constant care and attention was necessary to bring about complete healing. During the last five years I have not produced, either accidentally or intentionally, a sore of this class, but if I did I would try the

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effect of scraping the whole surface under an anæsthetic, and subsequently treating it upon strictly antiseptic principles. Most of the severe ulcers I have seen have been produced purposely, only a small area of the skin being attacked, the greater part having been protected during the exposure. I have seen one or two cases of accidental burns in which a large ulcer resulted; in one instance it covered the whole of the front of the chest and the upper half of the abdomen. I am sorry I cannot tell you how this case ended; I saw it only once, and have since been unable to obtain any news of it.

In these large accidental X-ray burns the ulcer is not, as a rule, very deep, and the leathery deposit, previously mentioned, may not show itself. They are covered with yellow, unhealthy, granulating tissue, and freely secrete a large quantity of very thin pus. In a large burn, which has been produced at a very short distance from the tube, we may get a deep necrotic ulcer in the centre, gradually merging into an area of very superficial ulceration, and, outside this, an area of erythema with an edge of pigmented skin. I always look with suspicion upon an ulcer said to have been produced by the X-rays, from an unprotected tube in which the surrounding skin is healthy and shows no signs of pigmentation or of having received some damage.

For this reason I stuck to my opinion in the Galway case. I never had any doubt that the lesion was the result of a burn, but I had very grave doubts as to its method of production.

In a case in which precautions had been taken to protect the surrounding skin the difficulty of diagnosing an X-ray burn might be very great.

The results of even a slight erythema pass away very slowly, especially in cases in which pigmentation is well marked. I have known several cases in which the area attacked could be clearly defined months after all inflammatory symptoms had passed away, and in one or two instances the ring formed by the hole in the protective screen is now visible, although between two and four years have elapsed since X-ray treatment was discontinued.

In cases in which the epidermis has been destroyed, the skin never again assumes a normal appearance, and in cases in which deep ulceration has taken place, a scar remains during the life of the patient. It has been said that the scar tissue formed over Röntgen ulcers is particularly liable to secondary infection. Personally, I have no experience in this direction, but I have noted that, unlike ordinary burns, these scars show little or no tendency to contract. The skin formed over them remains soft and pliable, although it differs in many respects from the normal. Up to the present I have never seen keloid or malignant disease develop in an old

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X-ray scar. Indeed, I have treated several cases of keloid (the result of ordinary burns) with a marked degree of success. Owing to our now using much more powerful apparatus than we did in the early days, no dermatitis should follow a radiation made for the purpose of diagnosis; and should such a thing occur, it may be taken that the X-rays have been improperly applied, as the result of either negligence or ignorance.

As I have before said, there is a very great difference between a burn produced upon healthy skin and that produced upon a diseased surface. I have seen no trouble arise from the production of a limited dermatitis upon the head in the treatment of ringworm, whilst in two cases, in which a slight dermatitis was produced upon the chin in an attempt to remove an abnormal growth of hair, a lengthy course of treatment was necessary. I have previously pointed out that a disease which has extended to, or nearly to, the surface of bone cannot be successfully treated by the X-rays. It is also worthy of note that an X-ray burn produced over a bony prominence is exceedingly difficult, and in some cases impossible, to cure. In the treatment of ringworm upon the head it is unnecessary to produce a dermatitis of such severity that ulceration may follow, for it is now well established that the cells of the hair sheaths are amongst the first to undergo degenerative changes. These results may be brought about either at one sitting in which a measured dose is administered, or by a series of small doses given at proper intervals.

Holzknecht has placed in our hands a method of measuring the amount of active rays emitted from a tube, so that we are now enabled to administer a dose with some idea of the result we shall obtain. As, however, it is admitted that idiosyncracy, the age of the patient, the position of the lesion, and other factors, have to be taken into consideration in addition to the personal equation which has to be reckoned with, this method, although a scientific one, falls far short of our requirements, and, in addition, it is too expensive for every-day use in hospital practice. Holzknecht's pastilles certainly give us a better idea of dosage than any other method at our command, but they fall far short of perfection, and I am hoping that before long we may have a better method of measuring the quantity and quality of the X-rays emitted from a tube in action.

Dr. J. L. Bunch, in an able article upon the treatment of ringworm (*Archives of the Röntgen Ray*, July, 1905), lays stress upon the point that whilst treatment by (so-called) exact measurement is certain, that by frequently repeated short exposures is to a great extent unsuccessful and dangerous.

Personally, I have only used Holzknecht's method for experimental purposes, and with varying results. I have,

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so far, relied upon my experience, and have given short exposures at intervals of a day or two, with results which have been eminently satisfactory. Dr. Bunch says that as many as forty exposures have been given in a single case. In looking over my notes I find that the largest number of (five-minute) exposures I have given is ten, and that I have, on one or two occasions, achieved the desired result in five. My reason for (up to the present) sticking to what may be considered antiquated methods is that by short and frequently repeated exposures I can watch my patient, gain an idea of his idiosyncrasy, and produce the desired result without running any risk of giving too large a dose.

I will not enter here into the question of the behaviour of tubes, it is far too lengthy a one for such a paper as this, but it must be admitted that the greater our experience, the more we become bewildered. It is generally admitted that what is known as a "soft" tube is the most dangerous in the way of producing a dermatitis, and that a "hard" tube is comparatively safe. Recent research has gone to prove that this is not a rule that can be entirely relied upon, and that an exact method of measurement is becoming daily more and more a necessity.

There can be little doubt that in the near future X-ray burns, as distinct from limited dermatitis, will, or should be, unknown.

Chronic X-ray Dermatitis occurs only in operators who are constantly exposed to the X-rays and who take no precautions to protect themselves from their deleterious influences. It is absolutely avoidable, and no workers who take proper precautions should suffer. It occasionally comes on as the result of an acute attack aggravated by subsequent exposure, but as a rule it has followed a slight erythema, which was attributed in ignorance to other causes, and which on these grounds failed to impress the enthusiast with the danger he was running in exposing himself to the rays, until it was too late to take the necessary precautions. I have already written so much upon this subject that it may appear unnecessary for me to enlarge upon it. I only wish to do so from the point of view that all knowledge is of value, and that prevention is better than the acquiring of a disease which can be avoided.

After the publication of my last paper on this subject, and the publicity which it called forth, I was deluged with letters from all parts of the world offering me advice which, if I had followed, I should not now be alive to tell the tale. I could write a very funny article upon the various methods of treatment advised, but I will content myself here by stating that so far the only good achieved has followed protection from the further influence of the rays.

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It is only within the last few weeks that I have noticed any benefit from either the protection or treatment I have adopted, and I am now doubtful as to the permanency of the results.

As a further contribution to the history of chronic X-ray dermatitis I will describe the present condition of my hands in the words of my friend, Dr. Douglas Heath, who has watched my case for several years and who, being a dermatologist, is in the position to better describe it than I can myself:—

"The skin over the dorsal surfaces of all the fingers on both hands feels considerably thickened and tied down to the subjacent tissues, and is of a dull red colour with numerous warty prominences scattered freely over it. These warts vary in colour from a light yellow to a deep brown, or even black, and the skin around them shows, usually, a considerable amount of hyperkeratosis. They can be picked out of their beds sometimes with ease and leave small crater-like holes of a dark red colour. After a few weeks fresh warts will be found occupying the sites of those removed. The red colour of the skin seems to be dependent on an almost uniform permanent erythema, which is masked over large areas of the fingers by the great thickening of the cuticle. The telangiectasis which was formally present has now almost disappeared, but a few dilated venules can still be seen in the skin on the back of the hand and around the metarcarpo-phalangial joints. The diseased condition of the skin increases in intensity greatly over the terminal phalanges of the fingers, hyperkeratosis being very marked and the warty nodules being almost confluent. The nails, especially those of the index and middle fingers on both hands, are barred and fissured longitudinally and are also deeply indented. The horny cuticle over the fingers is almost always cracked and frequently shows deep fissures which readily bleed. Over the roots of the fingers and the backs of the hands there is much less erythematous redness and the skin generally is not so much thickened, but numerous scattered warts, some of fairly large size, are visible here and there."

I will here add a few additional details of my own. The skin over the knuckles, having lost its elasticity, renders extreme flexion of the joints impossible without producing cracks which, when once formed, take weeks, or even months, to heal. The warty growths are, as a rule, most difficult and painful to remove, but occasionally they separate and come off quite easily. When they are cut or filed off they always recur, but when they come away by themselves they do not return in the same form.

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Additional precautions to protect myself have certainly rendered the hands and arms less painful, and the loss of power in them is not so marked as it was twelve months back; at the same time there is considerable pain at intervals, and there is ever present an amount of smarting, tingling and burning.

I said in my last paper upon Chronic X-ray Dermatitis, that it was one of the most painful maladies known, and I have only to add that further knowledge, gained from several other cases which have since been brought to my notice, enables me to confirm that opinion.

The Treatment of X-ray Dermatitis.—A very slight erythema may be left alone, it will generally disappear in a few days. A marked erythema is best treated either by powdering it over with starch and zinc oxide, or by applying an evaporating lead lotion on lint. A severe dermatitis, such as results in the formation of bullæ, should be protected from the air. Lint soaked in lead lotion and opium, and covered with gutta-percha tissue or oiled silk, forms an excellent dressing. Any of the remedies used in superficial scalds or burns may be used with good effect, with the single exception of boracic acid in any form. Personally, I never use boracic acid to dress my X-ray, or light burns, unless it is necessary to keep up the irritation.

Very superficial ulcers should be protected from the air, and should be at first dressed with carbolic lotion (1 in 60), and later with lotio rubra. I have already said something about the treatment of deep ulcers, and can only lay stress upon the fact that antiseptic methods, or as nearly antiseptic methods as possible, are indicated.

In the treatment of chronic X-ray dermatitis, I have little to add to what I have already said. I have found that the filing down of the warts and the nightly wearing of gloves soaked in lanoline gives me the most ease. The cracks are best relieved by painting them with ætheris nitrosi, containing 10 grains of nitrate of silver to the ounce.

Protection from the Deleterious Action of the X-rays.—Although I have limited the title of my paper to X-ray dermatitis, it is absolutely necessary that I should briefly mention some of the other known effects of prolonged exposure to the rays before entering upon a discussion upon the various methods of protecting both operators and patients. I say "known effects," because there is a possibility that there may be several, which we have not as yet fully recognised; for instance, the effects of prolonged exposure to ionised air and to doses of ozone are not fully appreciated. Some of the effects of ozone have been described, but it may be that some of these are attributable to ionised air, for it is next to impossible to artificially produce one without the other. To

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members of our Society who have leisure, and who are dying to distinguish themselves, I would suggest a research on these lines. The effects produced by prolonged exposure other than dermatitis are :—

Pigmentation of the skin ;
Falling out of hair ;
Effects upon the heart ;
Conjunctivitis ;
The production of sterility.

All these have to be taken into consideration in planning out a perfect method of protection. One would naturally imagine that the most perfect method would be one which would cover the tube with the exception of a small window through which the rays could be directed to the required area. This may ultimately turn out to be the best, but up to the present it is not entirely satisfactory owing to the fact that the tubes thus manufactured are not reliable. The next method is one in which an ordinary tube is enclosed in a thick lead glass covering, and the rays are directed to the required part by means of glass tubes of varying diameter. This method is unsuccessful from the fact that the metal attachment for holding the tubes in place in some way deflect the electrical currents and rapidly spoil the tubes. The enclosing of the X-ray tubes in boxes lined with thick india-rubber, or packed with red oxide of lead is good, but inasmuch as no two tubes are the same size one is soon landed in difficulties.

The covering of the tube with a pliable jacket of special made india-rubber with an adjustable opening opposite the anti-cathode is good, but it is open to the same objections as the last-mentioned method, viz., that the jacket will only fit a certain make of tube and not accurately any two tubes of the same make.

It was long ago suggested that the interposition between the tube and the patient of an earthed sheet of aluminium would stop all deleterious effects ; this is a fact, but even if the sheet have a hole in it opposite the diseased surface, it is open to the objection that when using other than very soft tubes at close quarters the spark prefers to jump from one terminal to another through the aluminium rather than to pass through the tube. Again, if such an arrangement be used without a hole the rays which do good, and may do harm, are cut off.

Having given a fair trial to all these methods, with very varying results, I have come back to my original method (with variations to protect myself), and have produced, and am producing, better results than those obtained by the use of any of the methods already mentioned.

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In actual practice my patient is protected by a specially made mask which protects all but the area to be treated. I make my masks of plaster of Paris bandage, which when dry are covered with several layers of thin tin or lead-foil, a hole being left in the mask over the area it is desired to expose to the rays. These masks are most easily made, and they have the advantage over ordinary masks in that they fit and are easily adjusted to the right position. My method of procedure is this: let us suppose that I wish to treat a rodent ulcer on the cheek. I first take an ordinary bandage and wind it round my patient's head so as to entirely cover all the hair upon the face with exception of the eyebrows, which I smear over with vaseline. I now place over each eye a small piece of cotton-wool and apply vaseline to the skin generally. I now apply a properly prepared plaster of Paris bandage in strips overlaying one another, taking care to leave the area I wish to treat uncovered. I then cover the whole with a paste of plaster of Paris and water and leave the mask *in situ* for a few minutes to set, when it is lifted off and allowed to dry. When quite dry, I paste upon it (using either a thick glue or some photographic mountant) several layers or either tin or lead-foil. I find that six thicknesses in addition to the mask will protect the skin from an amount of radiation sufficient to produce the results required. I have so far never seen a dermatitis occur beneath one of these masks, although with a fluorescent screen the X-rays can be plainly seen to pass through the mask and skull. A mask of this kind can easily be prepared for any portion of the body, and as it is always moulded to the part it falls into its proper position without any effort at adjustment.

As an additional protection I place between the tube and the mask a screen made of from six to twelve thicknesses of tin or lead-foil held between two sheets of cardboard, with a circular hole in the centre larger than the hole in the mask. This is held in position by means of an ordinary tube-holder on the top of a stand which can be raised or lowered as desired. I have at hand several of these stands, also several screens without holes, so that I can protect any portion of the patient and myself from the rays.

There is one point in the manufacture of the masks which is of importance, and that is, on no account must the tin-foil come over the edges; indeed, it is best to allow a quarter of an inch between the foil and the plaster mould. If the metal touches the skin a spark will pass, which speedily produces a sore.

I prefer to use an unprotected tube and these masks, because I have found from actual experience that some of the devices designed for closing in the tube divert the current and quickly render the tube useless; whilst with others it is

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impossible to obtain the necessary reaction no matter how long or frequent the exposures. I will not enter into a discussion upon the various theories which may account for this as my time is limited, and most of you are, perhaps, better acquainted with them than I am myself.

To protect myself I, in the first instance, keep as far away from the tube as possible, and in addition I wear a pair of steel gauntlets which appear to protect my hands perfectly. I say appear, because with a hard tube I can easily see the bones of my hands through the steel, and although we know that the deeply penetrative rays are the least harmful, we are all aware that they do produce effects the full measure of which we have yet to appreciate.

We are informed that our German and French colleagues use methods of protecting themselves far in advance of those used by us. I am of opinion that they are right. At any rate it is our duty to protect our assistants and nurses, even if we care to run risks ourselves; we should therefore insist upon our instructions being carried out, and see that they are.

Granted that proper precautions are taken, chronic X-ray dermatitis will soon become a disease of the past, and no one should be deterred from using the X-rays from the fear of contracting it.

I freely admit that in this short and imperfect paper I have left unsaid much which is of importance, but I trust that in the discussion which will follow we may all learn something to our advantage. If so, my humble effort will have attained its end.

Dr. LEWIS JONES: I am sure that all of us must feel, and feel with sympathy and regret, that Mr. Hall-Edwards's experience in this particular subject is such that it is not easy, when following him, to bring forward anything further into the discussion. The whole question is one of the most intense interest to those who work with X-rays. I am sorry to say that at St. Bartholomew's we are not without experience of chronic dermatitis. For my own part, I always use heavy rubber gloves, of the kind we have just seen, and I have escaped fairly well. At the Annual Exhibition, here in Leicester, aprons of india-rubber tissue are on view and are likely to come into use. At St. Bartholomew's the risks of dermatitis are now evaded in part by a frequent change of operator. The authorities at St. Bartholomew's have arranged for frequent changes of nurse in the electrical department and the screen work, which is carried on daily in the forenoons for the house surgeons, is now under her supervision. This liberates the attendant from part of his duties in connection with the X-ray work, and he is

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consequently losing his dermatitis. On the other hand, the nurse does not suffer to any perceptible degree during the limited time in which she is engaged with the X-ray work, and she leaves this branch of work unscathed at the end of the period of service.

We must all feel gratified to know that Mr. Hall-Edwards himself is able to report an improvement in the condition of his own hands from that in which they were a year ago. The report which he then made before the British Medical Association at their Oxford Meeting, certainly made one fear that a chronic dermatitis, when once acquired, was impossible to get rid of, and I congratulate him heartily on his progress towards recovery.

Dr. D. ARTHUR: Mr. President and Gentlemen,—I have much pleasure in congratulating Mr. Hall-Edwards on his splendid paper. I quite agree with some of the things he has said. I am perhaps one of the new ones, having been dabbling in X-ray work only for some three years. This last winter my hands began to be affected with dermatitis. I found that they irritated when one tried to sleep at night. I tried raising my hands above my head with good results. Regarding the gloves: I do not think they need to be very opaque. I have been using a pair of leather gloves like gardeners use. I also use an opaque tube shield, which itself protects the hands, and find these methods to act very well. With a pair of those loose gloves you can slip your hand out quickly. I find now that my hands have healed up very well.

Dr. G. H. GRAHAM: Mr. President and Gentlemen,—Mr. Hall-Edwards mentioned oxygen treatment in connection with X-rays. I saw some years ago a clergyman in Sussex who had a large burn in the right groin through prolonged exposures to X-rays. This had remained unhealed for some months in spite of scraping and other forms of treatment. Just before he came under my observation oxygen treatment had been tried for six weeks without the slightest benefit.

With regard to the question of scraping I recollect in the discussion on Mr. Hall-Edwards's paper at the B.M.A. meeting at Oxford last year Dr. Radcliffe Crocker instancing a case of a patient who had been burnt by X-rays, and after much treatment, including scraping, the injured part was totally and deeply excised, yet even then it still refused to heal. This and my own experience would make me hesitate to recommend further destruction of tissue after an X-ray injury.

Of X-ray dermatitis I am glad to say I have had very little experience. I had a slight dermatitis on my own fingers which was distinctly painful, yet with a certain feeling of numbness which was very peculiar. I have since then always taken precautions, using gloves of chamois leather enclosing two or three layers of lead-foil or Watson's rubber gloves,

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which are quite opaque to the rays but are very hot to wear.

I fancy we shall see many more cases of dermatitis when Sabouraud's method of treatment for ringworm becomes more commonly employed, even though it may be carried out in the most careful manner.

I wish to associate myself with the other speakers in congratulating Mr. Hall-Edwards on his valuable paper.

Mr. E. S. WORRALL: I am sure we all appreciate the importance of the subject with which Dr. Hall-Edwards has dealt here to-day.

With regard to the number of exposures and the measurement of the dose in X-ray treatment, I feel that the present possible measurements are far from being reliable guides. The introduction of a milliampèremeter into the secondary circuit to measure the current going to and some of it through the tube; the use of these pastilles in varying atmospheric conditions; the estimation of the penetration of the rays from an excited tube, which is frequently varying; these means of measurement are so unsatisfactory, imperfect and insufficient, that they form but a poor guide to the estimation of dose.

I have not treated any cases of ringworm by a single exposure, but have brought about the desired effect in several cases in nine exposures, also in cases of favus nine exposures. In sycosis one case received only three exposures, several others only five exposures, the desired effect being brought about without any severe reaction.

Dr. HALL-EDWARDS then briefly replied.

Mr. HALL-EDWARDS's reply and the figures of the apparatus he described will appear in our next issue.

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ÆSCULIN IN CONJUNCTION WITH FINSEN LIGHT IN THE TREATMENT OF LUPUS VULGARIS.

By GEORGE H. GRAHAM, M.D.,

Medical Officer in charge of the Electrical Department, East London Hospital for Children, Shadwell, E.

Mr. President and Gentlemen,—Experiments in sensitising animal tissues to the action of light have been carried out by Georges Dreyer in Copenhagen, who read a paper on the subject before the Royal Danish Academy, and also by W. J. Morton, of New York.

Dreyer used a 30 ampère arc lamp, concentrating the light through a train of quartz lenses similar to those in use in Finsen's apparatus, and as the sensitising agent, a 1 in 4,000 solution of erythrosin. Very considerable differences were shown in sensitiveness between sensitised and non-sensitised cultures, and I would refer you to his paper for the interesting table of his results. Among other points he has shown that cultures of Bacillus Prodigiosus sensitised with erythrosin are sterilised in the yellow green rays of a spectrum cast by a quartz prism.

Morton states that he has used Quinine Bi-sulphate and Æsculin, excited by Radium and by X-rays; of the two he preferred excitation by Radium.

I was at first deterred from using Erythrosin by the fear that a permanent stain might remain after its injection, and, later on, by the information given me by Dr. Reyn, of Copenhagen, that, when injected in a strength of 1 in 4,000, severe reactions followed its use with Finsen light, causing much pain and often sloughing of the tissues.

Some here present may recollect a slide shown by Dr. Gamlen, when he read a paper before this Society last November, of a patient who, following an injection of Erythrosin in the neck and an application of Finsen light, had a deep ulcer develope, which had resisted all methods of healing during several months, and even then remained unhealed. I shall again refer to this action of Erythrosin in discussing that of Æsculin.

I have used Æsculin excited to fluorescence by a 20-ampère arc light passing through the Finsen-Reyn apparatus.

Æsculin ($C_{15}H_{16}O_9$), discovered by Minor in 1830, is a glucoside obtained from the inner bark of Æsculus Hippocastanum (Horse-chestnut), especially in March, before the buds open.

It is bitter, very sparingly soluble in cold water, but easily in boiling water coagulating quickly again on cooling. If the solution is made slightly alkaline by the addition of 2 or 3 per cent. of sodium carbonate, the coagulation is prevented. In two

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or three days after a solution is made it turns dark in colour, and it should therefore be used freshly made. Heat at 230° resolves it into Glucosan and Æsculitin. Sonnenchien gives as a delicate test for it, that if it is agitated with a small quantity of nitric acid, it yields a yellow solution, which assumes a deep blood-red colour on addition of ammonia.

Æsculin is one of the highest fluorescent bodies in existence to our knowledge, and I believe passes through the system unchanged. Calvi attributed convulsive effects to it in doses of 2 milligrammes, but Amore afterwards considered this due to thk glycerine used to dissolve it. Morton has given it in 1 grain doses without ill-effects.

I gave myself a hypodermic injection of 5 minims of a 5 per cent. solution, rendered alkaline by the addition of 3 per cent. Sodium Carbonate. No pain was caused, nor did any constitutional disturbance follow. Fifteen minutes after the injection, the urine showed slight evidence of fluorescence. Another specimen passed an hour after the injection was very distinctly fluorescent, and this increased markedly during four days that I kept it, leaving a fluorescent deposit on the side of the test tube. It was evident that as alkaline changes took place in the urine, it became more fluorescent.

Doubt was expressed by a member of this Society at a recent meeting as to whether fluorescein and like bodies did actually fluoresce in animal tissues, and with this object I had injected, under the shaved skin of a guinea-pig, 5 minims of a 5 per cent. solution of Æsculin. Having removed nearly 3 square inches of skin, together with the subcutaneous tissue and some muscle, and stretched it over a ring, I passed the 20-ampère carbon arc light through the Finsen-Reyn apparatus on to it, exactly as if a patient was being treated, and found the whole of the skin (1 mm. thick) and subcutaneous tissue very fluorescent. Where the muscle remained attached the fluorescence was not so evident: the tissues there being at least 3 mm. thick.

With regard to the absorption spectrum of Æsculin, G. G. Stokes, in the *Philosophical Transactions*, vol. 152 of 1862, gives a diagram showing a band between G. and of the solar spectrum.

C. G. Schmidt (*Annalen der Physik und Chemie*, No. 5, 1896) gives a band from wave lengths 410 to 257; the maximum of intensity being at wave length 361; from wave length 257 the absorption increases in intensity in the extreme ultra-violet.

Nicholls and Merritt, in the *Physical Review*, New York, vol. 19, 1904, give the position of the absorption band as from wave length 480 to 340, but state that they put twigs of horse-chestnut into water and did not attempt to isolate the glucoside itself.

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Dr. Eyre and I have recently been carrying out some bacteriological experiments with Æsculin and the Tubercle Bacillus of fish, but as these are still incomplete I regret I can give you no definite conclusions on this occasion.

Being such a fluorescent body, only a small dose is necessary; and in practice I have used from 1 to 5 minims of a 5 per cent. solution hypodermically. The solution is better used within two days of being made. The needle is passed only just through the skin—not deeply into the tissues—and the injection is made immediately under the spot to be treated.

The reaction following an ordinary Finsen sitting is usually over by the third day, but after sensitising with Æsculin I have observed it to last from four to seven days longer. It has also seemed to me that Æsculin remains in the tissues for some days, as I have noticed that Finsen sittings have had stronger reactions than normal when given in the neighbourhood of an injection after even four to five days.

In Lupus Vulgaris cases I have now given considerably over one hundred injections, no ill-effects following in any instance; and I think the chief value of Æsculin in this disease will be found in the treatment of the obstinate isolated tuberculous nodules that sometimes remain after a preliminary course of ordinary Finsen treatment has cleared up the disease in the surrounding structures. Such nodules I have seen rapidly disappear after being sensitised, though several previous applications of the light had been made.

I have also found Æsculin given in this way to be of material assistance in softening thickened fibrous scars in character similar to cheloid that so frequently follow the scraping of Lupus patches, and which form such excellent harbouring ground for tuberculous nodules from which they are very difficult to eradicate.

Now, how can the action of Æsculin be explained? It seems to me to be a purely physical one. The term fluorescence proposed by Stokes, is applied to the conversion of the invisible ultra-violet rays into visible ones; that is, their refrangibility is lowered, their wave length being increased. Certain substances, both fluid and solid, emit a glowing light in virtue of their absorption of ultra-violet rays; among the most powerful of these, as stated above, being Æsculin.

In the original Finsen or Finsen-Reyn apparatus, a concentrated light combining various rays is used, the principal rays, having a therapeutic value, being the blue, violet and ultra-violet. But it is known that the ultra-violet rays, though having the strongest therapeutic and bactericidal action, have very slight power of penetration into animal tissues, consequently the remarkable results that have been admittedly achieved in the treatment of Lupus by Finsen's method are probably due chiefly to the blue and violet rays.

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Now I would suggest that Æsculin—a powerful absorbent of ultra-violet rays—gives them off again in the wave lengths corresponding to the violet and blue and by causing a great local excess or concentration of these rays at the time the light is applied, and by its prolonged fluorescence in the tissues afterwards clears up the tuberculous nodules more rapidly than the arc light alone.

Whether this clearing takes place by the direct bactericidal action of the rays or by phagocytosis is a question I shall not enter into here; but probably each has its sphere and the ultimate result due to a combination of the two.

The effect of this concentration and prolonged action is shown by the yellow-green rays in Dreyer's experiment with Erythrosin, but an interesting point arises in connection with the practical use of this substance and one that I should like to hear explained, viz., the destruction of tissue that I have mentioned frequently takes place when Erythrosin is made to fluoresce in it. The longer wave lengths of the yellow-green portion of the spectrum are supposed to have little therapeutic effect, whereas those of the shorter blue-violet are acknowledged to have a strong action, yet Æsculin, which gives off the latter, I have shown to be free from ill-effects; while Erythrosin, giving off the yellew-green, proves painful and destructive.

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THE RÖNTGEN CONGRESS IN BERLIN, 1906.

WEDNESDAY, MAY 3rd.

(Continued from page 187.)

The fourth and last day of the Congress was again devoted to medical discussion, and, in addition to radiographs, patients treated by Röntgen rays were presented to the Congress.

Professor LASSAR (Berlin) maintained that Röntgen therapy would probably have made yet greater progress were it not for the fear of the incurable injury to the tissues by the rays. This progress could only be attained when more effectual measures for the protection alike of doctor and patient were at disposal. In the first enthusiasm for the rays and their supposed effect upon diseases of the skin severe injury was sometimes occasioned, and many who were suffering from but a slight illness and dreaded an operation, were disfigured for life by use of the rays. Medical science was placed in the strange position of having to devise special treatment for the cure of burns caused by Röntgen rays. This early difficulty had soon been surmounted and the lecturer was able to refer to hundreds of cases of skin diseases which he had successfully treated with Röntgen rays, such as cancroids and carcinoma, which had been regarded as inoperable. Treatment by Röntgen rays was often preferable even to an operation, the success of which could be relied upon, especially in cases of cancer of the face, because the resulting scar was less disfiguring than that caused by the knife. The Röntgen treatment is indicated even in advanced incurable cases as it alleviates great pain. The lecturer denoted the success of the rays in healing carcinomatous wounds as exceeding the wildest imagination. The effect of the treatment of cancerous skin diseases is limited only by the penetrating power of the rays. Until now cures could only be effected to the depth of ½ cm. and thus could only be applied in cases quite near the surface of the skin.

Dr. ALBERS (Schönberg) described an astonishing case in which a patient, after being twice treated with the rays for altogether 24 minutes for a large tumour in the head, showed such a marked improvement that the treatment, which had been interrupted, was again resorted to for a total period of 168 minutes. The patient himself appeared before the Congress. Hardly any trace of the disease was now visible, and the spot treated by the rays was covered with a new growth of hair.

Drs. BOUCHACOURT and HARET (Paris) spoke about internal radiotherapy, or endo-radiotherapy, hitherto difficult in diseases of the mucous membrane because of the difficulty

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of placing the affected part in a position to which the Röntgen tubes could be applied. These Paris doctors use a tube of a special form which can be inserted in the natural cavities so that the rays can be applied internally, not only in the mouth but also in the vagina and the bowels. This form of treatment is particularly recommended for cancerous and tuberculous disease of the tongue, larynx, œsophagus, cancer of the neck of the uterus, etc.

Drs. COMAS and PRIO, related to the Congress their experience in the treatment of cancer by Röntgen rays, which are specially recommended in cases where, after operation, the formation of fresh skin over large surfaces would be involved, or in cases such as the eyelid, where the free movement of the organ would be affected. In new growths in intestines and glands, where the ravages are sharply limited in extent, of slow growth and accompanied only by slight glandular swelling, the Röntgen treatment is particularly recommended. Also in cases when after operations the growth again recurs, the use of the rays will nearly always either afford relief or check the advance and may be applied to the scar after a cancerous tumour has been removed.

Dr. BELOT (Paris) remarked that the success of this treatment depends greatly on the correct dosage of the rays.

Dr. UNGER (Berlin) reported on Professor von Bergmann's good results in the treatment of superficial cancerous tumours of slow growth affecting skin and mucous membrane. In the treatment of cancer of the breast, relief of pain, the healing of suppurating surfaces, and the disappearance of cancerous cells from the skin can be achieved, but a cure has not yet been effected by the ray treatment. The proposal to apply the rays during the course of the operation has shown itself impracticable, and the attempt to prevent recurrence of the cancer by application of the rays has not given trustworthy result.

Dr. SJÖGREN (Stockholm) recommends the application of the rays immediately after operation for malignant tumour in order to destroy any morbid traces of the disease, a procedure which he is confident will produce important results.

Dr. WOHLGEMUTH (Berlin) treated with the rays a deep-seated tumour in the breast as large as an apple and caused its dissipation. The acute pain was generally lessened after the first application. Fifty-two applications of five minutes' duration were required, great care being taken to protect the patient from any ill-effects of the rays. Carcinoma of the uterus can be alleviated and the chief tumour reduced; total success, however, cannot be expected.

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Dr. H. E. SCHMIDT, of the Berlin University Light Treatment Institute, cited a number of cases successfully treated by Röntgen rays. These included different skin diseases, cancerous tumours, tuberculosis of the skin, warts, psoriasis, herpes, etc.

Dr. GOCHT (Halle) exhibited some plastic material, similar to that used by dentists, which can be suitably employed for protective masks, etc., and an alarum working to a second, which automatically switches off the rays at the time fixed, and warns patient and doctor by a bell.

Dr. KIENBÖCK (Vienna) showed a quantimeter for the very accurate dosage of the rays.

Dr. STREBEL (Munich) reported on the use of external cathodic rays in therapy. He was the first to demonstrate the exceedingly strong effect of these rays, which cause severe inflammation of the skin, although very little scar results. This he proved by showing his own arm with traces of injuries which he himself had thus caused. He considers these rays particularly suitable for the treatment of tuberculosis and cancer of the skin, and that they probably might be advantageously employed internally in cases of cancer of the intestines and uterus.

* * *

The last sitting of the Congress began with a discussion on some properties of the Röntgen rays, which seem to require particular attention from the point of view of medical jurisprudence.

Dr. HENNECART (Sedan) quoted various doctors who had observed cases of sterility of the male and female sexual organs, both of man and animals, caused by the rays, and drew attention to the dangers of a misuse of this property, which, according to existing laws, was not punishable, although, on the other hand, the operator or the person producing an abortion is liable to heavy punishment. This question is of vital importance, especially in France, from the point of view of depopulation.

The lecturer, referring to cases of radio-dermatitis, claimed that doctors alone should have the right to use the rays for therapeutic or other purposes.

Drs. XURELLA and BECHER (Berlin) were of opinion that this point should be settled by international agreement.

Dr. SCHENK (Salzburg) informed the Congress that the matter had already received attention from the Austrian authorities.

Dr. HOLZKNECHT (Vienna), who had attempted to ascertain the exact strength of ray necessary to produce sterility but had found no one willing to voluntary submit to

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this experiment, concluded that the danger of misuse was not great.

A resolution was passed recommending that treatment by Röntgen rays be limited by law to properly qualified medical practitioners.

Dr. EHRENFRIED (Berlin) showed a radiograph of the lungs and abdominal organs of a young man of twenty, all of whose internal organs lay on the wrong side although he was perfectly healthy and strong.

Dr. SCHÜRMAYER (Berlin) spoke about the movements of the diaphragm seen in the radiograph and the possibility thereby of ascertaining any diseased condition.

Dr. IMMERMANN (Berlin) explained his procedure in "Orthoröntgenography" of the heart. It is now possible to obtain the actual life-size picture of the heart, which is of immense importance, as now the therapeutic effect of the Röntgen rays on the heart can be readily recognised. Pictures obtained by both old and new method were given.

Dr. HEINZ-BAUER (Berlin) showed Röntgen tubes in which the hardening was avoided by a very simple contrivance by which a very equable strength of ray, combined with a prolonged existence of the tube, is obtained. Demonstrations were given of a new process of cooling the tube by air instead of by water; the anticathodes, after being used for hours, showed no sign of glow.

A third tube was shown in which the degree of hardness can be altered at will; also a giant tube which, as opposed to other large tubes, gave particularly sharply outlined radiographs, and may be specially recommended for veterinary surgery.

Professor EBERLEIN, acting president for Professor von Bergmann, gave a brief *résumé* of the work accomplished by the Congress at which 77 lectures had been delivered, most of which had given rise to exceedingly instructive discussion. The Congress had most adequately achieved its object.

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NOTES AND ABSTRACTS.

X-rays and Ringworm.—MacLeod has devised an improved method of procuring defluvium at one sitting. The electrical current is obtained from a lighting main continuous supply. A "dipper" mercury break is employed and a 12-inch spark coil. Connected with the break is an instrument known as a "speed counter," which records on a dial the number of plunges of the dipper into the mercury of the break. The dial is divided into fifteen divisions, each of which are subdivided into two. Each subdivision indicates 500 plunges of the dipper into the mercury, and when the indicator has passed once round the dial 15,000 plunges, or "makes" and "breaks" of the primary current are recorded. The dipper is adjustable and is fixed so that it will plunge 1 cm. into the mercury, and the speed of the break is regulated so that it will give about 1,000 plunges per minute.

A special stand has been made to hold the tube. It consists of a wooden upright stand inside which is fitted a series of three wooden frames, in the central one of which a lead glass shield is fixed to hold the tube. These frames are fitted with hinges and a pivot in such a manner that the shield can be moved in any direction required. To the opening in front of the shield lead glass cylinders of diameters varying from 11 cm. downwards are fixed. These are of such a length that when the patient's scalp is placed against the mouth of the cylinder, it will be 15 cm. distant from the anticathode. A maximum diameter of 11 cm. is chosen because beyond that the rays become blurred, and it is of primary importance to have as uniform an exposure of the whole area exposed as possible. At the junction of the shield and the cylinder a small metal disc is adapted to hold the barium-platino cyanide pastille, which can be removed at any time during the exposure to compare it with the standard tint. On the left column of the stand Dean's modification of Benoist's radiometer on a sun and planet system is fitted to ascertain the quality of the rays. Two horizontal arms are fixed towards the top of the stand, from which glass protecting screens hang down. On the left arm a valve tube is placed to impede the reverse current from the tube, and on the right arm a milliampèremeter. Besides the meter a lever is fixed at the angle between the right arm and the column, which works on a quadrant divided in centimètres, and adjusts the spark-gap between the two poles situated at the ends of the arms so that when the lever is moved down to say 10 cm. on the quadrant, it means that a spark-gap of 10 cm. has been interposed. These various instruments are all connected in circuit. To produce the defluvium at one sitting the following conditions are adequate: (1) a tube of such tension that the rays from it show 3 to 4 degrees of penetration as indicated by the radiometer; (2) a spark-gap of about 10 cm.; (3) a current of about two-fifths of a milliampère in the secondary circuit; and (4) about 16,000 interruptions of the primary current. Before exposing the scalp, the tube is regulated to fulfil the above conditions, and an exposure is then given, which is continued till the indicator on the speed-counter records 16,000

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interruptions, the pastille being examined occasionally to avoid going beyond the required tint, and the state of the tube being kept as constant as possible during the exposure by means of the regulator and the resistances.

All this may seem to be complicated and perhaps unnecessary, but a permanent alopecia is a serious thing, and it is wise to take every precaution to avoid it. To depend entirely on the pastilles, though they have proved so reliable, does not seem to be advisable, as it is not inconceivable that while adjusting them they may accidentally have become damped or be otherwise altered, and give a false reaction time in consequence. Besides, by the above arrangement it is possible to prescribe so many discharges from a tube, the tension of which is kept as constantly as possible of the required degree for any special therapeutic purpose, with the amount of current passing through the tube also kept under control. —*Brit. Med. Journal*, September 16th, 1905. R.H.C.

* * *

Treatment of Hypertrophy of the Prostate by X-rays.—Moszkowicz (Vienna), basing his treatment on the fact that enlargement of the prostate is due to a proliferation of the glandular elements, has applied X-rays to several well-marked cases with very gratifying results. He exposes the prostate through a cylindrical rectal speculum. The anus and adjoining parts are protected by a leaden mask. Three applications of 15 minutes, on alternate days were given, and the size of the prostate was much diminished, and the patients were able to micturate without instrumental aid. One of the three, however, had an attack of epididymitis and another, cystitis, shortly after the exposures. The writer, however, is unwilling to attribute these complications to the treatment. — It is to be regretted that no measure was made of the currents employed or of the spark-gap of the tube. Irradiations of such structures we think should be regulated with almost more than ordinary care. R.H.C.

* * *

The Relation of Leucocytes to Erythrocytes in the Treatment of Leucæmia with Röntgen Rays.—Arneth has carefully followed the blood changes in cases of leucæmia under treatment with X-rays, and comes to the following conclusions: The number of leucocytes constantly diminishes until in some cases, at least, the the normal is reached. Simultaneously there is an increase in the number of erythrocytes, but this increase is relatively slower. The hæmoglobin also increases, but not in proportion to the increase in the number of red blood cells. The colour index never reaches the normal point. The erythrocytes reach their maximum some time after the leucocytes have become normal in number, and may even continue to increase when a recurrence, with increase of leucocytes, has already begun. In such cases there is a subsequent decrease in the number of erythrocytes, and a still more rapid fall in the amount of hæmoglobin. With the increase of red blood cells normoblasts disappear from the circulation, only to reappear

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as the blood again assumes its leucæmic character. Their reappearance occurs even before the blood has reached the point at which they were no longer found in the circulation.—*Münch. Med. Woch.*, August 8th, 1905. R.H.C.

* * *

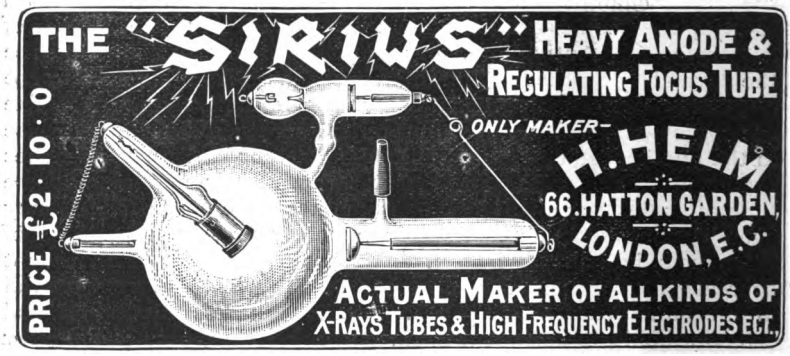
We have received from Messrs. Watson & Sons, of High Holborn, their new catalogue, which forms an interesting collection of the latest forms of apparatus for electrotherapeutic use.

NOTICE.

Members taking part in discussions or making remarks on papers, etc., are earnestly requested to give their notes on same to the Secretary at the end of evening, so that the proceedings may be complete and not delay the prompt publication of the Journal.

Publications.

17.—The proceedings shall be published in such a manner and at such times as the Council may direct. A copy shall be forwarded to each Honorary and Corresponding Member of the Society, and to every Ordinary Member whose subscription is not more than one year in arrear. Fourteen days' notice should, whenever possible, be given to one of the Secretaries by any member who wishes to show a clinical case or to make a communication to the Society. A copy of the paper in a form fit for publication in the proceedings must be furnished at the same time. The paper shall be the property of the Society for publication in the proceedings, without prejudice to the author's right to reprint or insert in any recognised medical paper or periodical. In all such cases the author shall state that the paper was read before the Society.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MEDICAL

Electrology and Radiology.

No. 10. OCTOBER, 1905. Vol. VI.

EDITORIAL.

The report of the Executive Committee on the proposed Union of Medical Societies in London is of great interest and we append it in full. The society to which it is proposed to give the name of The Royal Society or The Royal Academy of Medicine, will include 22 existing societies and will consist of 16 sections, with power to add new sections, and all members of existing societies will have the option of joining the new society in full or any section alone. Each section will have its own President, and have also the power to make the necessary laws and regulations for the conduct of its business. Provision is made for a monthly publication which will record the work of each section. These are the main features of the proposed amalgamation and there are many obvious advantages to be gained. Any present member of the existing societies has the right to join the new society without entrance fee, and if he becomes a Fellow can attend all the meetings of the sections and have the full use of the library at an annual subscription of £3 3s. From the Auditors' accounts it is shown that the scheme is financially sound on the basis of the present membership of all the societies that it is proposed to include, and it is most probable that a very large majority of medical men in London would take advantage of this new arrangement. The Proceedings which would record the work of each section would be very valuable to all. It is much to be hoped that the scheme will meet with unanimous approval and we heartily endorse the concluding remarks of the admirably drawn-up report of the Committee, that "the Union will do much to enhance the prestige of British Medicine, that it will increase the value of the work at present carried out by existing societies, and that it will be to the great convenience of the Medical Profession."

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UNION OF MEDICAL SOCIETIES.

Report of the Executive Committee as amended and adopted at the Meeting of the General Committee of Representatives of the Societies, held on July 19th, 1905.

Your Committee beg to report that in accordance with their powers they co-opted Mr. Makins, and appointed Dr. Arthur Latham and Mr. Herbert S. Pendlebury to act as Honorary Secretaries.

We instructed Messrs. Newson-Smith, Lord and Mundy, Chartered Accountants, to investigate the rolls of membership and the accounts of the following societies :

Medical; Royal Medical and Chirurgical; Pathological; Clinical; Obstetrical; Gynæcological; Neurological; Epidemiological; Medico-Psychological; Opthalmological; Laryngological; Laryngological-Otological-Rhinological Association; Otological; Dermatological of London; Dermatological of Great Britain and Ireland; Society for the Study of Diseases of Children; Odontological; Association of Medical Officers of Insurance Companies; Balneological; Society of Anæsthetists; Electrotherapeutic; Therapeutic.

The Accountants inform us that the twenty-two societies whose membership lists were collated, have a total membership of 7,229, constituted by 4,997 persons. Of these, 3,725 are members of one society only, and the balance, 1,272, are members of more than one society.

The Accountants, upon the figures placed before them by the societies, further inform us that—

The balance of assets (including certain bequests and trust funds) over liabilities of these societies is more than £40,000.

If 3,800 members of societies other than the Royal Medical and Chirurgical Society become members at a subscription of £1 1*s*. per annum, the New Society will have a small balance of income over expenditure. If any members of these societies become Fellows at a subscription of £3 3*s*. per annum, the balance will be proportionately increased.

This estimate is based on the present income and expenditure of the Royal Medical and Chirurgical Society together with the present income and expenditure of seventeen other societies as given in subjoined table, and makes no allowance for any economies which may be effected by the Union.

Estimate of INCOME and EXPENDITURE of the proposed Royal Society if housed at 20, Hanover Square, on basis of Income and Expenditure of existing eighteen Societies for the year ending December 31st, 1904 :

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Expenditure.		Income.	
Royal Medical and Chirurgical Society	£4,307	Royal Medical and Chirurgical Society	£4,911
Loss of rent by Union ...	770		
Of other seventeen Societies.		*Of other seventeen Societies.*	
"Transactions," less sales, but without allowance for income by advertisements	2,545	Rent of Medical Society ...	940
Staff	650	Investments	350
Library and Museum ...	166	Interest from investment of present cash balance ...	50
Interest on obligation ...	121	Entrance fees	186
Stationery, miscellaneous and exceptional expenditure ...	1,670	3,800 subscriptions at £1 1s.	3,990*
Balance	198		
	£10,427		£10,427

In view of the facts that 3,525 persons already subscribe £1 1s. to these eighteen societies per annum, that 1,272 pay from £2 2s. upwards, and that under the proposed scheme many individuals who are not Fellows of the Royal Medical and Chirurgical Society would become Fellows of the Royal Society of Medicine at an annual subscription of £3 3s., your Committee consider that the New Society would have a sufficient balance of income over expenditure to provide for improvements and for any sinking fund rendered necessary by extensions to 20, Hanover Square, supposing that all the scheduled societies joined.

This is shown more clearly from the following estimate of subscriptions which may be received from members of the various societies who are not Fellows of the Royal Medical and Chirurgical Society :

†600 members of societies as Fellows at £3 3s.	£1,890
3,200 members at £1 1s.	3,360
Library subscriptions at £1 1s., say... ...	525
	£5,775

* The actual amount received last year from subscriptions by these seventeen Societies was £5,033.

† The estimate of 600 is arrived at as follows :—The latest figures supplied by the accountants show that 1,300 individuals pay £2 2s. upwards in annual subscriptions.

[751	individuals	belong to	2 societies.
300	,,	,,	3 ,,
134	,,	,,	4 ,,
72	,,	,,	5 ,,
31	,,	,,	6 ,,
5	,,	,,	7 ,,
6	,,	,,	8 ,,
1	,,	,,	9 ,,]

The number of Fellows of the Royal Medical and Chirurgical Society who pay £3 3s. per annum is 440 ; of these, 390 are members of one or more other societies. If we deduct 390 from 1,300 we have left 910 as the number of individuals—apart from Fellows of the R.M.C.S. who pay £3 3s.—who belong to more than one society. The Committee suggest that probably 600 of these would become Fellows of the New Society at an annual subscription of £3 3s.

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If this £5,775 replaces the conservative estimate of £3,990 from subscriptions in the foregoing estimate of income and expenditure, the estimated annual balance of £198 becomes £1,983.

We cannot obtain further information as to the financial practicability of the scheme until we know exactly which societies have definitely decided to join the proposed Royal Society.

Your Committee suggest that every member of the societies which amalgamate shall have the option of joining the New Society, subject to the rules of the said Society, without entrance fee, and that as far as possible members of these societies shall retain their present privileges in the New Society. For example, any Fellow of the Royal Medical and Chirurgical Society who has compounded for his subscription will be entitled to join the Royal Society of Medicine as a Fellow without further payment of any kind, and the member of any society who has compounded for his subscription will be entitled to join the corresponding section of the Royal Society of Medicine without further payment.

Your Committee consider that the following suggestions might be embodied in a scheme for the formation of the New Society, namely, that:

1. The New Society shall be called the Royal Society of Medicine or the Royal Academy of Medicine, according to the vote of the societies concerned.

2. All monies, books, premises, and other properties belonging to any of the societies which join the proposed union shall become the property of the New Society.

3. The Society shall be housed at 20, Hanover Square.

Increased accommodation, if required, can be obtained by extending the premises, and by the absorption of certain rooms now occupied by tenants of the Royal Medical and Chirurgical Society.

4. The Society shall meet four or more times a year to discuss subjects of medical and scientific interest.

5. The Society shall consist of the following Sections with power to add new Sections, or to modify existing ones with the consent of the members:

1. Anæsthetic.
2. Clinical.
3. Dermatological.
4. Diseases of Children.
5. Epidemiological.
6. Laryngological, Otological, and Rhinological.
7. Medical.
8. Mental Medicine (Psychiatry).
9. Neurological.
10. Obstetrical and Gynæcological.

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11. Odontological.
12. Ophthalmological.
13. Pathological.
14. State Medicine.
15. Surgical.
16. Therapeutical, including General Therapeutics, Pharmacology, Electrotherapeutics, Balneology, and Climatology.

It is hoped that in the early future an Anatomical and Physiological Section may be formed.

6. The Society shall consist of Fellows, Members, Honorary Fellows, and Honorary Members.

7. The Fellowship of the Society shall be restricted to men who are registered medical practitioners of the British Empire, and to men whose scientific attainments are satisfactory to the General Council.

8. A Fellow shall pay, subject to any future bye-law, an annual subscription of £3 3*s*., and shall have the right to attend all meetings of the Society or of any of its sections, and shall have full use of the Library. After the Society is constituted (*i.e.*, after a date to be subsequently determined) a new Fellow shall pay an Entrance Fee of £2 2*s*.

9. Each Section shall have the power to elect as members of the Society such persons as the Council of the Section may think fit, provided that the names of the candldates proposed for election be previously submitted by the Sectional Council to the Council of the Society for their approval.

10. A member of any particular Section shall pay, subject to any future bye-law, £1 1*s*. per annum, and shall have the right to attend all the meetings of his Section, but must pay an additional £1 1*s*. per annum if he wishes to have the use of the Library, and a further subscription of 10*s*. 6*d*. per annum for each additional Section.

11. The general management of the Society shall be under the control of a General Council, consisting of the President, the Presidents of the various Sections, two Treasurers, two Librarians, two Secretaries, and eight other Fellows.

12. The entire management of the funds of the Society shall be in the hands of a Finance Committee, subject to and acting as a Sub-Committee of the General Council.

13. In order to enable existing societies to retain their individuality as far as possible, each Section shall have power to make the necessary laws and regulations for the conduct of its business.

14. The Presidents of Sections shall be *ex-officio* Vice-Presidents of the Society, and shall serve on the General Council of the Society.

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15. In the estimate, provision has been made for a monthly publication (July, August, and September excepted), to be called "The Proceedings of the Royal Society of Medicine." This publication will be under the control of an Editorial Committee, and will contain a record of the work of each Section during the previous month. By such prompt publication the value of the records will be greatly increased.

In addition, the Committee will select, subject to the approval of the General Council, such papers as they may consider worthy of publication in the "Transactions" of the Society.

The Committee further *suggest* that it would be to the advantage of the Royal Society if a Committee were formed of representatives of the various Sections, charged with the duty of receiving all papers to be read before the Society or its Sections. This Committee should have power to decide before which Section any given paper should be read, and to decide whether other Sections or the whole Society should be asked to join in the discussion. Authors of papers should have the privilege of suggesting the Section or Sections before which they wished to read their papers.

It is hoped greatly to increase the value of the present Library at 20, Hanover Square, and to provide an additional reading-room for the use of Fellows and Members.

Your Committee ask the various societies concerned to consider the scheme submitted *at an early date* and to inform the Honorary Secretaries of their views. As soon as the Committee is in possession of these views further steps can be taken.

In conclusion your Committee beg to express the unanimous opinion that the Union of Medical Societies will do much to enhance the prestige of British Medicine, that it will increase the value of the work at present carried out by existing societies, and that it will be to the great convenience of the Medical Profession.

(Signed) W. S. CHURCH, *Chairman.*

R. DOUGLAS POWELL.
HENRY HEAD.
JOHN LANGTON.
DAVID H. GOODSALL.
G. H. MAKINS.
CHARTERS J. SYMONDS.

ARTHUR LATHAM, } *Honorary*
HERBERT S. PENDLEBURY, } *Secretaries.*

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ON THE USE OF THE MILLIAMPÈREMETER AS A MEASURE OF X-RAYS.

By Dr. LEWIS JONES, London.

(Read at Leicester, July, 1905.)

The use of the milliampèremeter for measuring the quantity of X-rays given out by a tube has been already described by d'Arsonval for the particular case of a tube supplied from a high potential transformer with a valve tube of Villard in shunt to the X-ray tube.

In December last I showed some experiments on the use of the milliampèremeter in the tube circuit when an induction coil was used as the source of current, and a Villard's valve tube was used as a rectifier in series with the X-ray tube. Since that time, the method has been criticised and a recent English writer has stated that he has found the indications of the milliampèremeter less trustworthy than the pastilles of Sabouraud. These pastilles are certainly valuable, but they have the disadvantage of requiring long exposures before any visible effect is produced, and are, therefore, useful only in a certain class of cases.

Recently I have tried some experiments, by the aid of photography in the manner employed by d'Arsonval and I have prepared a series of lantern slides to illustrate this communication.

The plan has been to make X-ray exposures upon photographic plates, and to compare the densities of the resulting negatives when currents of different magnitude and different tubes are used. In all cases I have modified the time of exposure to compensate for the variations in the magnitudes of the current, doing this in such a way that the product of the number of seconds multiplied by the current in milliampère's, shall give the figure 20. Thus a plate exposed for 20 seconds to the rays with a current of one milliampère, is considered to be exposed for 20 milliampère seconds, and when the conditions of the exposure are changed, as, for example, to half a milliampère and 40 seconds, the exposure expressed in milliampère seconds is still the same. For purposes of comparison, I have made use of two classes of plate, one has been a slow plate, the other has been a plate of medium rapidity; thus I have obtained two sets of plates differing from each other, but comparable among themselves. At the outset I thought that it would be a simple matter, by making a few exposures, to obtain the answer to the question I had proposed myself, but, as a matter of fact, as soon as an investigation of this kind has been commenced, fresh points arise in an unexpected way, and the problem is very apt to increase in complexity as one proceeds.

The points, which have incidentally come out, I may mention very briefly :—Thus it appears that rapid plates are much more sensitive to X-rays than slow ones (as indeed might have been expected), but, further, my negatives also show that tubes, which appear to be working well, may be

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giving out little or nothing in the way of X-rays. Further, it seems as if the effect of high tubes upon photographic plates is somewhat different from the effects of tubes of a medium degree of vacuum.

In the experiments I have used five or six different tubes, differing very widely from one another in point of resistance, and, although the photographic effects upon the plates differ from one another to a certain extent where theory would require them to be identical, nevertheless they resemble each other sufficiently to justify the belief that the indications of the milliampèremeter are of considerable value as a measure of the magnitude of X-ray effects.

In some cases the currents producing the photographs have been three times as great as those used in producing others, and the times of the exposures have ranged between 20 seconds and 100 seconds, and yet the densities of the resulting negatives have differed but slightly from one another, except in certain special cases, and these I now propose to consider.

With tubes, whose resistance is not less than 4 or 5 centimetres of air gap and not more than 15, the indications of the milliampèremeter may safely be followed. For tubes of lower vacuum, the production of X-rays is much less than might be inferred from the indications of the milliampèremeter, while tubes with a resistance of less than 2 centimetres give out no X-rays at all although the current through them is considerable, and although they may appear to the eye to be fluorescing satisfactorily. Tubes, with a vacuum as high as 15 centimetres, are uncomfortable to work with and are difficult to measure correctly because the currents through such tubes are of small magnitude, and measuring instruments are generally not at their best near the zero of the scale. But after making allowances for this difficulty, I have noticed that with a very high tube, driven very hard, the photographic effect upon a slow plate may be very poor, although the effect of the same tube upon a plate of greater rapidity was intense, with the same degree of excitation. This seems to indicate the need for further investigation into the question of the behaviour of plates of different speeds and of different manufacture, when submitted to X-rays. This does not appear to have been undertaken hitherto. Following d'Arsonval, I have used the instrument of Benoist as the subject in all the photographs, which permits of an examination and comparison of the densities of the background, of the central silver disc, and of the aluminium sectors.

With low vacuum tubes, such as the tubes of Geissler, a current of 3, 4, or 5 milliampères can be easily sent through the tube, but in such tubes there is no production of X-rays, therefore in speaking of the measurement of current, we must assume that the tubes employed are of a proper degree of vacuum for the production of X-rays. In examining a series

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of exposed plates, I have found that a faint image is produced by certain tubes in which the measurement of the spark-gap was only 3 centimetres, and this seems to be near the point at which X-rays commence to be produced. When it has been said that the milliampèremeter is untrustworthy, the reason probably is that the tubes employed have been too low at first, or perhaps have become too low during the course of an application, though the change may not have been observed by the operator.

Mr. HALL-EDWARDS: I am sure we are all deeply grateful to Dr. Lewis Jones for bringing this subject before us. I have adopted the milliampèremeter method for some time and I cannot say that I have found it entirely successful, still I believe it to be a very good guide, and I should be sorry to be without it. There are reasons why it is not always an entirely reliable guide. These, however, I will not enter upon as my time is limited. I hesitate about starting on the subject of the behaviour of tubes, but I must say that the more we have to do with them the more bewildered we become. I was struck by seeing that there is a tube in the Exhibition which has been continuously worked for several days. This appears to me to upset some of our accepted theories. I was therefore very anxious to see the effect of that tube upon the screen after its long run, and was surprised to find that it was capable of producing such good photograpic results. A beautiful result was produced on the screen, and new theories must now be formulated to meet the altered conditions. I have been exceedingly interested in this paper of Dr. Lewis Jones's because I was, some years ago, engaged in comparing plates for the rendering of colour valves. Those of you who are not accustomed to photographic experiments will not exactly know what this means. Some colours are not properly translated into black and white by ordinary photographic plates; special plates, however, under proper conditions, give us the desired results. Special plates have been designed for our work, but I think that there is room for further improvement. Indeed I am of opinion that even now the best results can be produced on ordinary plates. It appears to me that some of Dr. Jones's negatives are fogged, to an extent; and that therefore they cannot be accepted as giving absolute results. This suggested to me the idea of asking Dr. Jones the length of time the plates were developed. Of course, these researches take up a considerable amount of time, and I must congratulate Dr. Jones on his experiments; he is a busy man, but it seems to me that it is the busy people who find time to do the most work. I am sure that we ought to be most grateful to him for the trouble he has taken in these experiments. He is exceedingly good to bring the subject before us, and to put into the hands of the younger members of the Society the material for further experiments. I feel sure that when the action of tubes is understood a little better we shall be in a position to deal with these subjects in a more efficient manner.

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Dr. BRUCE: I have unfortunately only just heard a small part of Dr. Lewis Jones's most instructive paper. There can be no doubt from what he has said that the milliampèremeter is of great value in the measurement of the amount of ray emitted from a tube. I must apologise for introducing the question of tubes, but the amount of current passing through a tube and the tension of the tube are so intimately connected that I have ventured to raise the question. It appears to me that the tension of a tube is altered by two factors: First, the heating of the anode; and, second,—to my mind the more important,—by the heating of the glass of the bulb. The oldest and most commonly known method of lowering the resistance of a tube is, after all, by heating the glass of the bulb.

If even tension could be secured in a tube, the amount of X-rays produced would be more steady, and therapeutic and radiographic results more certain, especially with an accurate milliampèremeter on the secondary of the coil.

With this aim in view I have tried the effect of rendering the heating of the glass impossible by immersing the whole tube in an oil bath.

I have found, working with such a heavy discharge as produced by a 22-inch coil, with 35 ampères, 100 volts on the primary, that a tube which has a water-cooled anode and in addition an oil-cooled bulb will remain at an even tension for a period of 1½ minutes.

One tube lasted for 30 half-minute electrolytic exposures with the same coil and current, without regulation. I must admit that since then other tubes have not done so well, but I think this was due to faulty construction. The arrangement of a tube in an oil bath is not difficult, and with smaller amounts of current I think the production of the rays would be even in amount during long exposures.

Dr. J. A. CODD: Mr. President and Gentlemen,—I should like to say that I have found one difficulty in using a milliampèremeter. It has been that when the tube is very low and the milliampèremeter reading high, little or no X-rays are given out. What is the limit below which the milliampèremeter does not give correct readings in terms of X-ray energy? I am very glad that Dr. Lewis Jones has given us the definite indication of the limit, being 1½-inch or 1¼-inch parallel spark gap. I think it will be a very great help to us in our efforts to ascertain scientifically the amount of radiant energy that is emitted from the tube. There is one other point: that is as to the correct amount of choking effect necessary to eliminate the closing current. I have found a fair amount of difficulty with valve tubes. My experience is that they rapidly get high, and offer resistance to the current and choke all that is going through the tube. I think the spark gap gives more satisfactory results, seems more easily regulated. I should like to ask Dr. Lewis Jones why it is that the spark gap choking effect is regarded as being inferior in efficacy and practicability to the valve tube.

Dr. LEWIS JONES then briefly replied.

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LEICESTER MEETING, JULY, 1905.

DISCUSSION ON THE EFFECTS OF HIGH FREQUENCY CURRENTS ON BLOOD PRESSURE.

Opened by Dr. H. McCLURE, London.

Mr. President and Gentlemen,—This Society has every reason to congratulate itself in the good work it has already achieved—work done in the purely physical scientific side, and also its large contribution to Electrotherapeutics. Yet it seems to me that there are certain parts of the broad field of observation that have not had as much attention as their scientific worth demands.

I think you will agree with me in considering that the most important and indeed the essential point in dealing with the action of electricity on the human organism is its influence on *physiological processes*. Here we stand on the firm ground of science.

First amongst these I would take the blood pressure, especially as it is influenced by high frequency currents. I need not dilate on the important *rôle* high blood pressure plays in inducing pathological conditions, nor need I point out the paramount importance of arresting such condition before degenerative changes have set in. That such heightened blood pressure can be lowered by the judicious application of these currents I am most amply satisfied. Yet there seems a wide difference of opinion amongst us on this very matter.

I am most anxious, Sir, to call forth the opinions of the members of this Society on this most important point. Surely this is a matter that ought to be easily and definitely settled. It may be this discrepancy in opinion is due to the different mechanisms used for the production of the currents, or may be to faulty estimations of the blood pressure.

My attention has been directed to this point for some nine years. In my earlier observations I depended on my finger and Dudgeon's sphygmograph in estimating the blood pressure. For the last six years I have always used Hill and Bernard's sphygmometer, which I find very reliable. My method of application is as follows :—The blood pressure is first taken, the patient reclining on the couch, which is attached to the resonator. For the first four minutes the abdomen, especially the region over the liver, is sprayed by an electrode, attached also to the resonator; the remainder of the ten or twelve minutes the patient simply remains on the condensation couch receiving the current through the two handles. The blood pressure is again taken.

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The subject of the effect of electricity over the temperature of the human body I approach with some diffidence, as my experiments, I am afraid, are far from complete or satisfactory to myself.

Yet I feel, even in their incompleteness, I am justified in bringing them before the notice of this Society, so that others may be incited to experiment on somewhat similar lines. I am not aware of any record of the body temperature being reduced or heightened by the application of electricity.

My method of procedure was as follows, an ordinary constant current battery being used :—

The anode 9 inches by 2 was applied to the cervical spine, while a round cathode of 2 inches in diameter was directed to the angle of the lower jaw—from 1 mm. to 3 mm. current strength being used, the time being one to three minutes to each side. A current of ½ to 1 mm. is also passed through each eye for half a minute, the round electrode being now made anode, the current being gradually augmented or diminished by means of a Lewandowski's rheostat. I have only two cases to record, one being myself. In both cases the temperature in the first five applications was reduced after each application, from two degrees to one degree, in the last five on myself the fall was less, being from half to three-quarters of a degree. In no instance was there a failure to reduce the temperature, which was taken immediately before and after. I have only been able, so far, to get one other person to submit himself for experiment, and in this case I failed to get any result. Of course, in the two cases there may have been some marked unstability of the thermic centres at the base of the brain or of one centre ; be this as it may, the subject is an interesting one. I hope to go more fully into it in the near future; in the meantime I hope some of the younger members, who have time on their hands, will take up such investigations as to how electricity affects physiological processes. By such work you will raise electrotherapeutics to a higher plane—a plane to which the pretender and the charlatan can never reach. If I might give you a watchword to be ever present with you in your work it would be the three scientific virtues : disinterested curiosity, unselfish candour, and unremitting care.

Dr. REGINALD MORTON : Regarding the action of high frequency one thing is contradicted by another in the reports one hears. I think it is a current we must handle with a great deal of caution, certainly in the stage at which we stand at present. It takes a good deal of assimilation to believe that you can pass through a patient 1,000 milliampères. I have not myself conducted anything in the nature of an exact investigation on this point.

In private practice I had a case which was rather

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interesting from some points. She was sent to me by a doctor for treatment. This young lady had various symptoms. Both her parents had died of some form of heart trouble. There was no actual organic lesion of the heart with her at all. I got one of my colleagues to overhaul her thoroughly. The report was that she had rather a high tension, with a certain amount of hypertrophy, and there was one little murmur. I think it was systolic. My friend wanted me to try high frequency. The general symptoms were general weakness—always felt slack; she had been doing a lot of parish work, and walking three or four miles there and back; she was a very self-denying girl, and had run herself down. She was greatly troubled with coldness of the extremities and sleeplessness. She had ten applications of high frequency; the insomnia absolutely relieved from the beginning. Her symptoms seemed to all improve. On her return home, where she had to return rather more quickly than I should have liked, she had very definitely improved in every way. She was more able to do the work she wanted without being unduly fatigued. The doctor to whom I took her for examination had not the slightest idea about what I was going to do. That opinion was just given to me, and was quite endorsed by me. It is a case of which I thought Dr. McClure might be interested to know; it certainly is a one which seems to have been influenced in the way he has referred to.

Dr. IRONSIDE BRUCE: I think it would interest you to know of a case of mine where a patient died during treatment by high frequency current. Indeed I was asked to give evidence as to whether the cause of death was due to the current or not. As to its effect in lowering blood pressure, I think there is nothing I have to say quite definite about it. The patient I refer to came for treatment at the hospital for painful neuritis affecting the left hand and arm. She was having the current by the ordinary method of auto-condensation, when, having placed herself on the couch, the current was turned on. Almost immediately she suddenly collapsed, it was noticed that she became very pale, and the treatment was at once discontinued. I thought at first that the patient suffered from an hysterical manifestation, but I soon began to see that there was something more serious the matter. The pupils were dilated, unequal and fixed, the breathing stertorous and the pulse slow and full. She was removed to the wards and died in a few hours. At the post-mortem it was found that there was a large cerebral hæmorrhage and that the kidneys were small and cirrhotic, the capsules being extremely adherent. My opinion was, since the patient had been previously under treatment several times without any bad effect—indeed she declared herself as feeling better—

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that the hæmorrhage was a coincidence and not the result of the high frequency treatment.

Dr. ELLIOT: I cannot say that I have had any experience in using high frequency current from the point of view of reducing blood pressure, and I confess that my experience is that there is not much to be got out of it. I should like to have heard of some really definite result being obtained. There is one thing that I should like to mention, the point of raising of blood pressure. I had an extraordinary case of Graves disease; attended by the ordinary symptoms, with the usual history. I treated this man with high frequency with good results. He recovered sufficiently to resume business; he also used to hunt, and altogether seemed to get along very well. I left off the high frequency—he had been taking it for some months. And then he began, feeling himself better, to do too much, and was taken ill again. I found him in bed; his pulse was about 120, there were the symptoms of sickness even to vomiting; he could take no food, and altogether was so ill that one felt there was not a chance for the man to live. Dr. Greatheart came to see him and told me that there was practically no hope of his getting better at all. I then told him about my having treated him with high frequency. He asked me if I really thought it had done him good, and when I told him so he said he would certainly advise having it in his bedroom. As they were extremely wealthy people this was done, and from that moment the man began to get well. His pulse would be perhaps about 105 or 110. I used to give him 10 minutes on the condensation couch. The pulse would go down after administration about 9, perhaps 10, or even 15 beats. At the same time it became more powerful. Now he has recovered so that he can walk and get about; he has done exceedingly well, and is really much better. He eats three excellent meals a day. I am afraid that it is likely that when he feels his strength returning he will overdo it again, but there is no doubt that the treatment has had this beneficial effect.

Now with regard to what Dr. McClure said—this is quite a different matter from the lowering, in disease. Of that I confess that I have absolutely no experience to offer. It is a most interesting question and I should like to hear more remarks upon it.

Dr. MCCLURE then replied: Mr. President and Gentlemen,—I am obliged to you for the kind manner in which you have received my remarks. We do not seem to have arrived at any definite conclusion in regard to the question before us.

In regard to those cases of low blood pressure where the high frequency currents raised such pressure I have no experience, I would prefer using static electricity instead, as

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in my experience this form of electricity invariably heightens such pressure.

In the case of death mentioned by Dr. Bruce I do not know that you can ascribe the death as due to electricity at all. Of course, there is the possibility that a very slight lowering of the pressure where the circulation was very much enfeebled might lead to disastrous consequences.

I think the discrepancy of opinion on these points may at least in some measure be due to different methods of application. I am personally convinced that where you have *high* blood pressure it can be lowered by a judicious application of these currents; my belief is that in these cases you have always a toxine at work, by its introduction to the blood stream it acts as an irritant to the coats of the arteries, and so induces a certain amount of contraction made more evident in the arterioles. By stimulating metabolism and elimination, you clear such toxines out of the blood and a lowering of the blood pressure ensues.

Ichthyosis cured by X-rays.—Leduc reports the case of a boy of twelve, whose body since infancy had been covered with brownish-black scales which desquamated and were renewed incessantly. Every form of treatment, both for the condition of the skin and his general health (which was precarious), proved useless. On April 4th, 1905, an exposure of X-rays was made with a low tube (No. 5 Benoist), the target being 40 centimètres from the part treated. The head, trunk and limbs were successively exposed for a total period of 12 minutes. A fortnight later the boy appeared better, desquamation had been abundant, but the scales had not recurred and islets of white skin could be seen. A second exposure, similar to the first, was given on April 19th, when continued improvement was observed. His general health was better and he was growing and putting on flesh. A third exposure was given on May 8th. On June 8th almost all the skin appeared normal, there were only a few small scaly patches on the ears, arms and legs. A fourth exposure was then given, and in July the whole of his skin was normal and his general condition very satisfactory. He only showed some involuntary movements of the eyes and a little nervous agitation.—*Arch. d'Elect. Méd.*, September 10th, 1905.

R.H.C.

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X-RAY DERMATITIS.

(Continuation of the discussion published in our last issue.)

Mr. HALL-EDWARDS in reply said: Mr. President and Gentlemen,—I thank you very much for the kind way in which you have received my paper and for your appreciative remarks; as, however, there has been no discussion there is little left for me to say. Most of the remarks seem to have turned upon the question of methods of protection. It follows

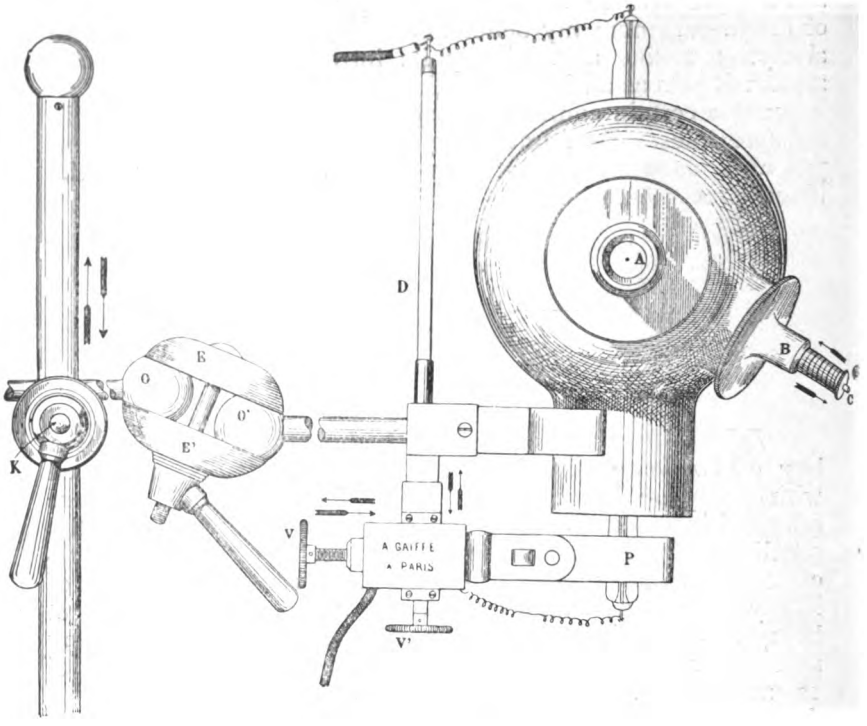

Fig. 1.

that the amount of protection necessary in any given case depends largely upon the amount of exposure to which the operator is subjected. When one is using the X-rays all day long, one requires very much more protection than in cases in which the X-rays are only used occasionally.

I stated in my paper that most of the methods of enclosing the X-ray tube in a shield had proved failures. I have here two shields which I should like to show you. This is the latest shield devised by Messrs. Harry Cox, Ltd. Granting that it is fitted to a tube which fits it, it is an excellent

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device; it is, however, far from perfect, and will stand further improvement.

The next shield is one which was only brought to my notice at the Exhibition here. It is made by Messrs. Gaiffe,

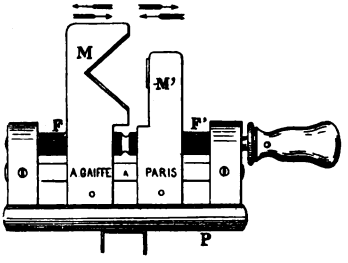

Fig. 2.

of Paris, from the designs of Dr. J. Belot, and has been kindly lent to me by The Medical Supply Association. It is

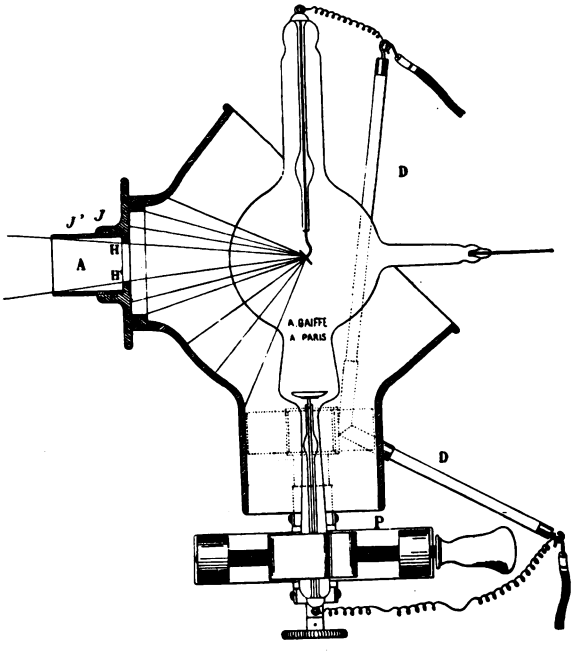

Fig. 3.

a scientific instrument designed on scientific lines, and overcomes all the objections which exist in the shield previously brought to my notice.

The shape of the shield is very much like those I have already mentioned (Fig. 1), but it is more roomy and will

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take all tubes but the very large ones of German make. The material of which the shield is made is guaranteed to be absolutely opaque.

The chief novelty consists in the tube-holder, which is so constructed that no matter what sized tube is used its

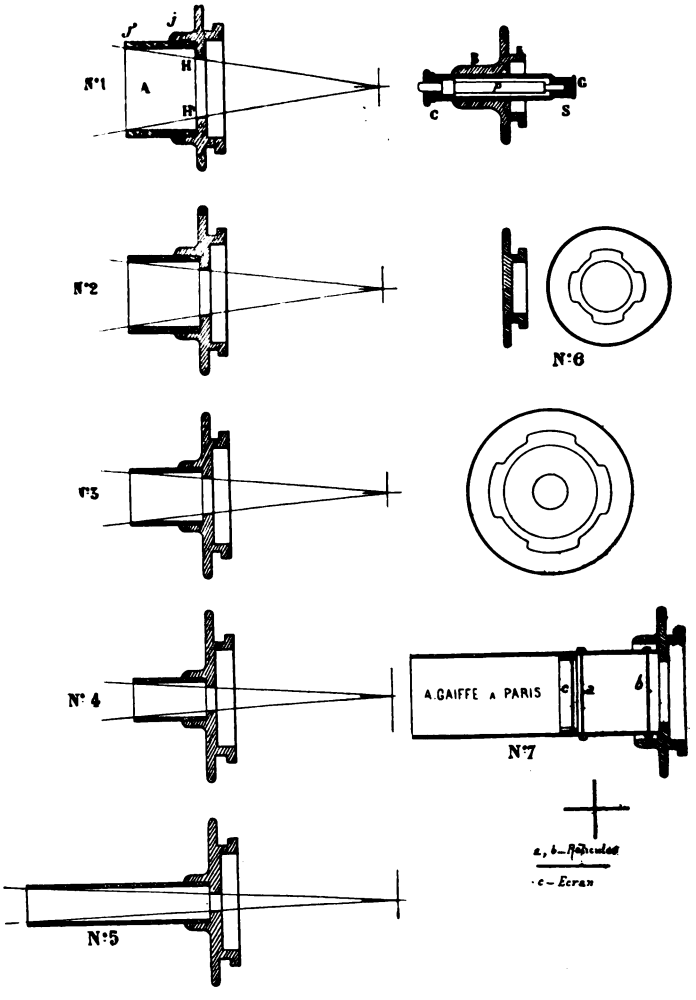

Fig. 4.

longitudinal axis is always held in the same position. The holder (Fig. 2) consists of a vice with parallel jaws which approach one another on turning the screw.

On again turning to Fig. 1, it will be seen that this holder, which works independently of the shield, can be moved up and down, and from side to side, by means of two

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screws (*V V'*), which enable the anticathode to be accurately centred. Fig. 3 shows the holder and shield, in section.

In the shields previously described there is no arrangement for centring the anticathode, hence the direct rays are but rarely used.

The shield is so made that the applicators (Fig. 4) can be placed in position and held firmly by their insertion and half a turn. The method of doing this is explained on reference to Fig. 4, No. 6.

The anticathode is centred by means of the applicator

Fig. 5 shows the general appearance of the apparatus.

No. 7, this consists of a tube containing two parallel crosses of wire in front of which is a small fluorescent screen. The tube is manipulated by means of the screws (*V V'*, Fig. 1), until the images of the two crosses coincide.

The applicators used for treatment (Fig. 4, Nos. 1, 2, 3, 4 and 5) are made of glass tube and are provided with diaphragms which allow only of the passage of a pencil of rays which cover the space of the tube's opening without striking the glass. In other words, all the rays which pass the diaphragm reach the skin, none striking the glass.

In the side of the shield there is an arrangement (Fig. 1, *B C*) for holding Sabouraud pastilles.

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This shield overcomes all the drawbacks mentioned in my paper, and, to my mind, is the most scientific arrangement yet devised.

I would like here to submit to you some of the material mentioned by Dr. Lewis Jones for making coats and aprons. It is said to be perfectly opaque to the X-rays.

In conjunction with the shield I would like to draw your attention to this new and novel mercury interrupter, which is a simplified form of the mercury jet, turbine type. (Fig. 5.)

A piece of iron of conical form (*d*, Figs. 6 and 7) is

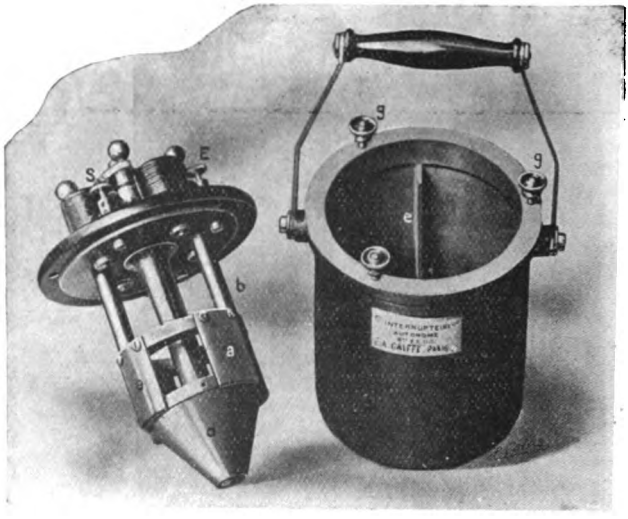

Fig. 6.—Note that the jet revolves, the teeth are stationary.

channeled by a single canal. This canal is obliquely inclined in relation to the vertical axis in such a way that on rotation the mercury (which when at rest fills the lower half of the canal) is, by centrifugal force, driven upwards and outwards through the orifice *o*, so as to jet against four copper teeth (*a*, in the diagram), connected at intervals with a metal crown (*c*, Fig. 7), insulated from the rest of the apparatus. Note that the jet rotates, the crown and teeth are fixed. The width of the copper teeth depends on the voltage—the higher the voltage the narrower the teeth.

It will be noted that there are no pipes, cog-wheels, or complicated mechanism for pumping or conveying the mercury jet. The single channel is so made as to be readily cleaned if necessary.

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The containing vessel is of iron. Figs. 6 and 7 show the vertical lamina projecting from the side in such a way as to check the rotary movement of the fluid when the interrupter is in use.

The quantity of mercury required is twelve pounds.

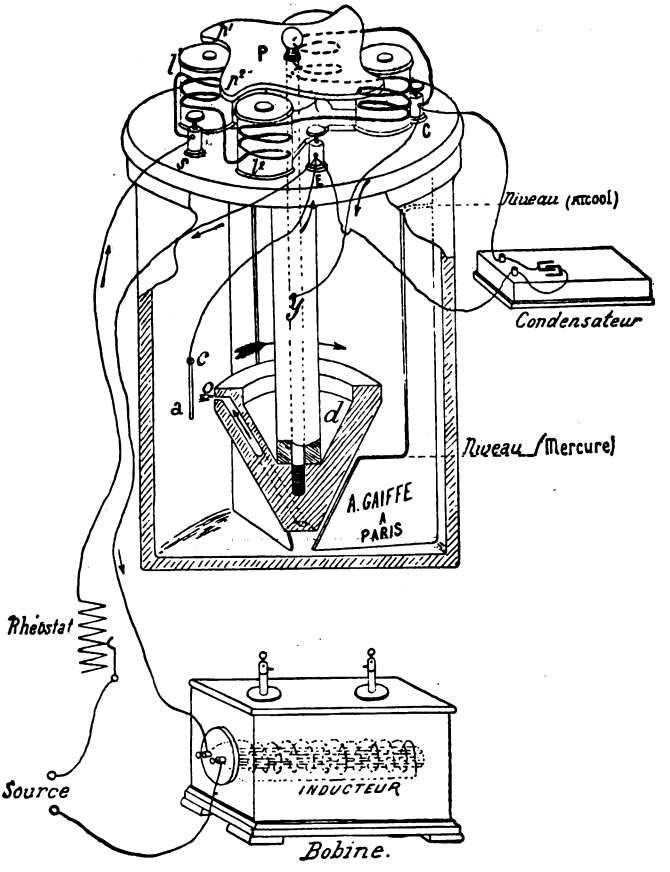

Fig. 7.

(Note that the interruption cuts the current both for Motor and Coil.)
Niveau = Level. *Inducteur* = Primary winding. *Bobine* = Coil.

The *Driving System*, by the direct electrical and mechanical coupling of the motor with the interrupter, constitutes a great advantage over the old types of turbine interrupters. The same interruption cuts the current both for motor and for coil. The *motor* is of the magnetic attraction type, with fixed winding and rotating armature.

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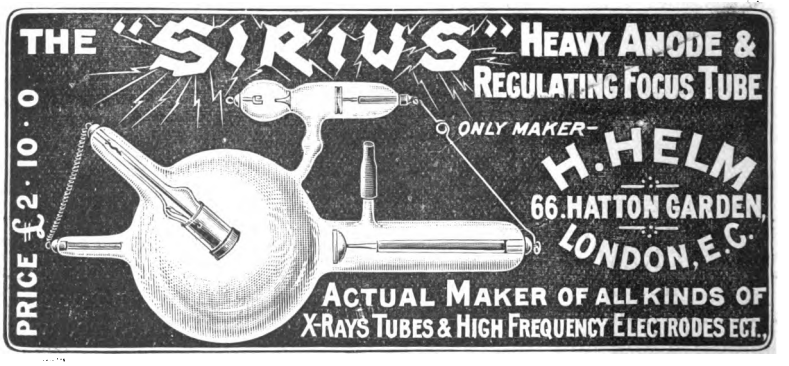
To regulate the number of interruptions we can adjust a rheostat placed in series with the primary winding of the coil as shown in Fig. 7. This is the plan recommended for installations on a main current—in this case no separate motor rheostat is necessary. Or a separate rheostat may be put in shunt with the winding of the electro-motor. This acts so that the motor winding is traversed by only a part of the current that feeds the primary winding of the X-ray coil. This plan is best for low voltages (from 12 to 60 volts), such as coils working from accumulators. In this case a separate rheostat for the current feeding the X-ray coil is also employed.

To summarise: The scheme of mounting an installation for a main supply of continuous current is the simple one shown in Fig. 7. The current comes from the source, traverses a rheostat in series, and as indicated by the arrow reaches terminal *S* of the interrupter, traverses the four windings of the motor and arrives at terminal *C*, thence it goes to the spindle *Y*, then to the metal piece *d*, and by the mercury jet to the tooth *A* and the crown *C*, then from *C* to the terminal *E*, then as indicated by the arrow through the primary winding of the X-ray coil back to the source.

This interrupter appears to me to be a distinct advance upon the older forms, and it has the additional advantage of being cheap.

Tuberculous Adenitis treated with X-Rays.—Desplats (Lille) cites three cases in which he has obtained great improvement. His observations included an examination of the blood, which showed an analogous reaction to that obtained in the treatment of leucæmia.—*Arch. d'Elect. Méd.*, August 25th, 1905. R.H.C.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MEDICAL

Electrology and Radiology.

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EDITORIAL.

To the demand for a "cure for consumption" the medical profession has as yet only responded with methods of treatment. The introduction of light treatment by Finsen raised widespread hopes that for one variety of tuberculous lesion a satisfactory "cure" had been discovered. But wider experience has shown that the light treatment constitutes only one factor in the "cure," the others being as yet unknown.

The treatment of tuberculosis, as of all other specific infectious diseases, has been carried out on two main lines: one in which an attempt is made either to eradicate the invading organisms, as by surgical methods, or to destroy the organisms, as in the iodoform treatment introduced by Dr. Burney Yeo; the other in which an attempt is made to assist the body in its struggle against the infection either by the introduction into the circulation of an antitoxin, or by supplying some substance which shall so alter the organisms as to make them more readily destructible by the blood cells. It will be seen that the physician's armamentarium contains several weapons which may be used singly or perhaps more efficiently in combination.

An organism which, like the tubercle bacillus, is essentially parasitic is usually found to meet with a strong resistance on the part of its host; and were it otherwise tuberculosis, instead of being widespread, would be absolutely universal. In all methods of treatment which have been introduced we have to consider whether we are dealing with a direct attack upon the invading organism, or a stimulation or mobilisation

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of the defending forces. The treatment of lupus is an excellent case in point. The disease is essentially chronic, and chronicity usually implies that there is fibrous tissue thrown up as a defence against the parasite by the host; in some cases isolating it so efficiently that a spontaneous cure is brought about.

The introduction by Wright of the blood examination before and during the administration of Koch's new tuberculin has shown us that it is possible to stimulate the body to the production of substances which he calls "opsonins." These act upon the bacilli in such a way as to make them an easy prey to the phagocytes. In lupus, however, surrounded by its wall of fibrous tissue, there is a difficulty in bringing invader and defender into contact. The lupus is in the position of a strongly fortified town besieged by a force that would be overwhelming were it able to surmount the fortifications. It is here that the application of radiotherapy and phototherapy is of avail. The effect upon the part subjected to the rays is to produce among other phenomena an increase of the lymph stream and an attraction to the part of the leucocytes from the surrounding tissues. There is no evidence that light rays do more than this. The treatment of keloid by X-rays, often with marked success, shows that in some way or other they are capable of bringing about the absorption of fibrous tissue. This is also seen when the scar after an operation for malignant disease is exposed with a view to prevent recurrence, the scar becoming much more supple than it otherwise would be.

It will be seen then that the treatment of lupus tends to resolve itself into the raising of the general resisting power of the body by fresh air, liberal diet and so forth, the raising of the specific resistance by the injection, for example, of tuberculin, and finally concentrating these forces to bear upon the local lesion by means of some such treatment as radiotherapy.

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ON THE RATIONALE OF RADIOTHERAPEUTIC TREATMENT.

By W. DEANE BUTCHER, M.R.C.S., Surgeon to the London Skin Hospital.

(*Read before the British Electrotherapeutic Society, October, 1905*).

Mr. President and Gentlemen,—When I was asked to read a paper before this Society, I doubted if I had any material worthy of your acceptance. The subject of the Rationale of Radiotherapeutic Treatment has for long occupied my thoughts. During some six years' practice of radiotherapy one could not help making conjectures as to the possible explanation of its brilliant results, and groping after some clue that should lead to still further triumphs. The time has perhaps not yet arrived when we can hope to frame a rational hypothesis of its mode of action, but to-night I shall endeavour to bring together the various phenomena for which we must account before we can hope to construct a valid hypothesis.

It was from the action of sunlight itself that we obtained our first ideas of radiotherapy. The psychical exhilaration, the nervous stimulation, the pigmentation, the etiolation, the phenomena of *coup de soleil* and the effect of concentrated sunlight on abnormal tissue must all enter into our original conception of radiotherapy.

It was soon discovered that it was the violet and the ultra-violet rays of the spectrum that were most potent in producing chemical and physiological changes. Finsen's method was the natural outcome of this discovery, and the other varieties of radiotherapy, by X-rays, by ultra-violet light, and by radium speedily followed.

In studying the effects of radiotherapy, I propose to consider those only which are universally accepted, the irreducible minimum of well-established facts.

1. Firstly we have pigmentation. All modes of radiotherapy produce pigmentation. This is commonly regarded as the first line of defence of the organism against the noxious action of the shorter waves of light. It is probable, however, that the pigment plays another and more important *rôle* in the economy. May not the pigment of the human skin, like the chlorophyll of plants, be regarded as a store of potential energy from which the organism may draw when required? It is hard to believe that the beautiful bronzing of a child's skin, on its return from the sea-side, is but a superfluous protection of no further use to the economy. I look on it as a sort of "potted sunshine," manufactured in the country, to be used as a store of energy in the twilight of the town.

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2. *Dermatitis.*—The second universal phenomenon is dermatitis, and dermatitis coming on after a definite latent period. In excessive doses all varieties of radiation give rise to reaction. This reaction sets in after a definite period of latency which varies with the degree and source of the irradiation. It also varies apparently with the wave length of the undulations. The dermatitis of a burn is immediate, that of *coup de soleil* occurs after some hours, that of radium after fourty-eight hours, and that of the X-rays after ten days or a fortnight.

Any hypothesis which attempts to explain the rationale of radiotherapeutic action must account for this period of latency, and the variation of its duration for undulations of different wave length.

Three different hypotheses have been advanced to account for delayed reaction after a period of latency, none of them being entirely satisfactory.

(*a.*) The first, that of Oudin, Barthélmy and Darier, attribute the Röntgen burn to a secondary degeneration of the trophic nerves. According to this theory the primary action is on the subcutaneous nerve cells. This is followed by an ascending irritation of the nerve filaments, and subsequently by a centrifugal neuritis. In certain cases some such action does undoubtedly occur. Pain and cutaneous lesions are occasionally produced in the territory of a nerve, when the main trunk has been exposed to prolonged irradiation. In one or two instances I have, I think, seen ulceration of the cornea apparently caused by prolonged irradiation of the face, although the eyes were protected by a thick leaden shield from the direct action of the rays.

(*b.*) The second hypothesis is that of Leduc. He considers the action of the X-rays as entirely due to ionisation. The electrolytic fluid, which bathes the living tissues, is partially ionised by the X-rays. Excessive ionisation will destroy the chemical equilibrium, nutrition exchanges will be diminished and the tissues badly nourished. The lesion only becomes apparent after a latent period in consequence of the deficient nutrition.

(*c.*) The third hypothesis is that of Bordier. He has shown that the X-rays have a marked effect on the phenomena of osmosis, a slowing of the current through the osmometer, and a diminution of the osmotic pressure. In his opinion, the thin walls of the capillaries first undergo this alteration in osmotic properties, and the consequent interference with the molecular exchanges is followed by disturbance of nutrition and inflammation.

We have seen then that neither pigmentation nor latency are as yet susceptible of satisfactory explanation.

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3. The third most noticeable effect of the various radiations is their action on abnormal, immature, or rapidly growing tissue. We are all agreed that the Finsen light, ultra-violet light and radium are all able to attack and destroy a lupus nodule, a rodent ulcer, or a limited patch of cutaneous epithelioma, without any injury to the surrounding integrement.

Any valid hypothesis must account for this so-called selective action of the various radiations.

There is another question which calls urgently for an explanation. How do you account for the fact that the X-rays are beneficial in such varied pathological conditions—in lupus and acne, in pain and pruritus, in varicose ulcer and cancer?

With this we may perhaps consider the kindred question —How is it that in many diseases treatment of the most varied kind appears to be equally efficacious?

I cannot help thinking that the answer to these two questions lies in the fact that every morbid process has a natural tendency to right itself, and that almost any alteration of environment or any external impulse or *secousse* will facilitate this change from the abnormal to the normal condition of molecular aggregation.

Let me try to explain my meaning.

I have here a model which perhaps will illustrate my meaning. The idea was suggested by Professor Osborne Reynolds's paper on the "Dilatency of Media," read many years ago at the meeting of the British Association at Aberdeen. This model, which is also illustrated in the diagram *A*, represents the arrangement of the molecules in normal healthy bioplasm. You see there is a certain stability in its structure. When it is deformed by an external force it readily regains its position of equilibrium.

This stable structure, however, is altered entirely by persistent pressure or deformation, an alteration of the environment which we may call disease. You see that when I exercise external pressure, the balls assume the position *B* of the diagram, an arrangement which possesses no stability, as the slightest shake will cause them to assume once more the normal position *A*; *B* then is my idea of abnormal or diseased bioplasm. The change which we call disease is represented by some external permanent deformation which changes the stable form *A* into the unstable form *B*. The latter has a spontaneous tendency to recovery, and the slightest external *secousse* will facilitate this change, just as any change in climate, in soil, any mechanical, chemical or electric stimulus will often tend to cure diseased conditions, and restore the aberrant forms of abnormal bioplasm.

We may call the formation *A* the tetrahedral formation, and the formation *B* the cubical formation, since, as you

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will observe, *A* may be built up of tetrahedra and *B* of cubes.

In the normal tetrahedral formation each sphere is in contact with twelve of its neighbours, while in the cubical formation each sphere has but six neighbours.

It is interesting to notice that in the normal healthy formation the conductivity of the bioplasm will be greater than in the strained and unstable cubical formation.

This can easily be shown experimentally, although the demonstration is not suitable for a lecture experiment. A little consideration, however, will show that in the tetrahedral formation the electrical current from any one molecule has twelve paths of metallic conduction, whereas in the cubical formation there are but six. The conductivity of the tetrahedral formation must manifestly be greater than that of the cubical formation.

If then we allow that the electric conductivity of normal and abnormal bioplasm differs, we can easily understand how a slight readjustment in the position of the molecules may re-establish the normal arrangement, and we can imagine no better means of doing this than by the action of magneto-electric vibrations.

If *B* for instance be a portion of nerve in an abnormal state, producing, let us say, a sensation of pain or itching, a very slight external influence may be all that is required to alter the arrangement to the position *A*, possessing quite other nervous and electrical conductivity. Surely there is no more suitable means to give the necessary *secousse* than electro-magnetic undulations of appropriate wave length. Could we time these waves aright, both as to magnitude and frequency, we might hope to be able to dictate the action of every nerve fibre and neurone in the body. This would be the ideal radiotherapy.

One must not press the mechanical analogy too far or suppose that the structure of the bioplasm is in reality what is here depicted. The mechanical illustration is but a means of visualising some sort of transformation—from the more stable normal arrangement to the less stable abnormal formation, and to account for the facility with which the change is made from the one to the other under the action of a variety of therapeutic agents, the most potent of which would be some form of electro-magnetic vibration.

Bactericidal Action.—I do not think that the last word has been said on the bactericidal or, as I should prefer to say, the bacteri-nocive action of the X-rays. When one sees a foul sloughing varicose ulcer cleansed by a single exposure to the X-rays, when one remembers the action of irradiation on acne and sycosis, and staphylococcic infection, one cannot help suspecting that the Röntgen rays have at

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all events a certain inhibitory action on bacterial growth in the living tissue. We require further experiments showing the action of brief and repeated irradiation on mixed cultures of bacteria growing in living tissue under the conditions which are met with in practice. I feel sure that under these conditions the rays are bacteri-nocive if not bactericidal, or at all events they seem to exercise a selective action on bacteria, just as they do on the elements of the tissues. We do not want more experiments in vitro—"such a culture was exposed for four hours to the X-rays without impairing its vitality." In practice, the smallest encouragement of the native, and the slightest discouragement of the alien may be all sufficient. Disease is often an immigration rather than an invasion. On the other hand disease may sometimes be a mutiny, a riot or a revolution. By radiotherapy, we do not desire to slay the immigrant, or to cut down worker and alien alike with grape shot. We use it as the mildest and gentlest means, discouraging immigration, hindering migration, and preventing the multiplication of the immigrants. For this purpose we may confidently call on the guarded and controlled action of the X-rays and radium, trusting to their selective action on bacterial growth and their etiolating action on immature and quickly growing tissue.

When sterner measures have to be resorted to, when the invader and the inhabitants have to be destroyed together, we have other and more certain agents at our disposal—the knife and the cautery. The X-rays should never be used as a cauterising agent. Indeed, in my opinion, the production of ulceration by X-rays is unjustifiable under any circumstances.

A paper has recently been published in St. Petersburg testifying to the advantageous effects of very small and feeble doses of radiant energy. For my own part I cannot too strongly insist on the utility of short exposures and careful dosage.

In the field with which I am more particularly familiar, that of Dermatology, there is hardly a chronic affection of the skin, from ordinary bad complexion to the severest ulceration, that does not seem to be affected beneficially by a few carefully regulated doses of some form of radiotherapy.

Occasionally, the X-rays seem to act like a charm, awakening the organism to new efforts and directing the attention to the breakdown of any weak or faulty spot. The organism has been accustomed, may be for months or years, to the presence of an acne abscess or an old ulcer. An irradiation often seems to call up the forces of repair, to provoke phagocytosis and stimulate absorption.

In other instances it may be that the ionization of the medicaments, either external or internal, is the *vera causa* of the improvement. A case of ringworm treated with oleate

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of copper ointment will sometimes rapidly improve after a few applications of X-rays; or an acne will disappear while a staphylococcic infection is being irradiated in another region, or enlarged glands will disappear from the axilla during irradiation of the breast. How can we account for these facts except by supposing that the X-rays have a direct action on the toxins of the disease, destroying these by their ionising action, or perhaps sowing free antitoxins in the irradiated area which are absorbed and distributed to other regions of the body.

Treatment by X-rays will then be a variety of antitoxin treatment, the antitoxin being produced and set free at the very spot where it is most required.

In conclusion, let us consider what prospect there is for further development of our art, and in what direction we should seek the most fertile fields for research.

From the Physicist we may hope for further knowledge of the ether waves and the theory of their action on the molecular architecture of the matter on which they impinge. From the Chemist we may hope for further discoveries in the *terra incognita* which bounds the confines of Physics and Chemistry.

From the practical Electrician we may ask for means of bringing our radiations at will to any note on the gamut of electro-magnetic vibrations, and from the Biologist we may demand a wider knowledge of the laws which govern the stimulation of bioplasm by ether waves of different periodicity.

We have among us many men with the necessary knowledge and the necessary clinical experience, and to them we turn confidently for a solution of some of the problems I have indicated. Unfortunately we have few with the necessary leisure for experimental research in a field which will assuredly in the near future yield a rich harvest to the enthusiastic worker.

I feel that my search for the Rationale of Radiotherapeutic Treatment has been a failure. One has only to attempt to put it on paper, to see how hopeless it is in the present state of our knowledge. Perhaps, however, I may have done some service in focussing the attention of the Society on the main points of our quest, "what we do not know, and what we want to know."

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ON THE EFFECT OF THE HIGH FREQUENCY CURRENTS ON ARTERIAL TENSION.

By Dr. BONNEFOY, Cannes.

(Honorary Member of the British Electrotherapeutic Society.)

Mr. President and Gentlemen,—I have been very much interested in the discussion raised at the general meeting of the British Medical Association at Leicester by our colleague Dr. McClure, because having made the action of the high frequency currents upon the circulation of the blood the object of many physiological and clinical investigations, I take this opportunity of asking your permission to give the result of these researches as briefly as possible, in order to add my modest tribute to the study of such an interesting question.

And, to begin, I think that in order to understand thoroughly the action of these currents, it is necessary to distinguish the difference between their action on a healthy man and on a man who is suffering from disease.

Indeed, if it be true (and the studies of Dr. Montier have amply demonstrated this) that when one is in a perfect state of health the high frequency currents always produce a lowering of the arterial tension, it is not always the same in the pathological state, and we shall see that in certain cases where arterial tension is found to be weakened the high frequency currents have the effect of raising it.

But one must not, however, confound the tension with the temperature, and it seems to me, in this respect, that the communication of Dr. McClure tends to error.

The superficial temperature is not in direct connection with the blood tension in the arteries.

I dare to say, on the contrary, that it is in certain cases, in an inverse proportion, and that as the hypertension diminishes, the heat of the body augments.

It is not, however, at the end of three or four sittings that that action manifests itself on the heat of the body; it requires a greater number, eight or ten at least, and frequently more, and still that heat does not immediately make itself felt all over the body; it is gradually felt, first on the hands and arms, the trunk, the knees, and lastly on the legs and feet.

By what means do the high frequency currents bring about this result?

In a former work I believe I have already shown by some observations, which seemed to me quite convincing, that these currents have only an indirect action on the central circulation and on the heart, while they act directly on the peripheral circulation by the medium of the vasomotor nerves.

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In fact, every time I have found myself in the presence of these pathological conditions, to which Professor Bouchard has given the generic name of *Maladies par ralentissement de la nutrition*, and no matter what may have been the first cause of these diseases, I have noticed that, after some sittings, the peripheral circulation becomes more active; the patient feels the heat penetrating all over his body, even in the extremities, at first with difficulty and then, after the first few minutes, quite easily; while in proportion as the peripheral circulation is restored, the tension diminishes in the arteries, a sign that the blood penetrates more easily in the capillaries.

Is it to be said, because of that, that the high frequency currents heighten the temperature of the body? No, indeed, for the temperature does not exceed the normal. It is more exact to say that it raises it, when low, by favouring at the same time the peripheral circulation, the chemical reactions, the oxidations more or less weakened or slackened on account of want of circulation, which causes that sensation of cold that the patients usually resent.

It is then quite indirectly that the high frequency currents diminish the arterial hypertension, and also indirectly that they have such a favourable action on the state of the heart, as it allows that organ to overcome the resistance of the capillaries with a slighter effort, that resistance diminishing and disappearing, thanks to the direct action of the currents.

And that is why I rise with all the force of my conviction against the fear expressed by a certain number of electro-therapeutic physicians who absolutely dissuade others from using high frequency currents when they find themselves in the presence of a case of a weak heart.

It is, on the contrary, in those cases that the currents are most indicated, as they come to the aid of the heart in helping a work that it can only do insufficiently by itself with greater effort.

I will not trespass on your kind attention by relating here, in support of that opinion, the numerous observations that I have already published, nor those more numerous still which are in my notes, and which will be the object of my next work. It suffices for me to say that I endeavoured to direct the attention of the medical men who have had the kindness to trust their patients to me to these facts, and who, I am convinced, would not hesitate to support me with their evidence.

Amongst those belonging to the English nationality I can name Drs. Bright, Sir Henry Blanc, Gordon Sanders, MacDougall, Mrs. Mary Marshall, etc., who have been witnesses of these results, and who most willingly expressed their satisfaction to me.

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I have already said that if the application of the high frequency currents has generally the effect of lowering the arterial tension. there are cases where, on the contrary, they have the effect of raising it.

The interesting observation brought forward by Dr. Elliot would be sufficient in itself to show this.

One must not believe that all the arthritic patients present a more or less pronounced arterial hypertension ; in certain cases, on the contrary, it is the hypotension that one notices, and Sir Lauder Brunton, to whom I made that remark some months ago, told me that he himself had also frequently noticed it.

It seems that in certain cases, the heart powerless, in spite of all its efforts, to carry on the general circulation, tires itself more and more until it only contracts weakly, and then it is that to the initial hypertension succeeds a hypotension due to that weakness of the heart.

If, in those cases, one applies the high frequency currents, the peripheral circulation becomes more active, the functions are revived, the heart, stimulated by the greater flux of blood to the auricles and the freer circulation in its own walls, resumes its normal force of propulsion. It is like a renewal of the general vitality.

That is what came about in the case of Dr. Elliot's patient.

This patient, suffering from a very severe form of Graves' disease, showed a considerable arterial hypotension, and yet Dr. Elliot did not hesitate to apply the high frequency treatment. And he was quite right, for his patient felt himself so much better that he allowed himself to do many tiring things in spite of the doctor's orders. In consequence of that overwork the patient had a very grave relapse, so grave that Dr. Greatheart, who was called in consultation, declared that he considered that there was practically no hope of his recovery.

Dr. Elliot decided to again apply the high frequency currents, and as the patient was in an extremely weak state, unable to leave his room, and unable to take any nourishment, he installed in his bed-room the necessary apparatus in order to be able to treat him.

After some sittings of ten minutes' duration, the number of pulsations, which were 105 to 110, diminished after each sitting by 9, 10, and even 15 pulsations. The forces returned as well as the appetite in such a way that the doctor had no further fear except of seeing his patient begin again the exaggerated exercises which had provoked his relapse.

I had, last spring, to treat a patient in whom the state of health approached nearly that of Dr. Elliot's. My patient was sixty-two years of age and of arthritic constitution. He

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was attacked, in 1894, in Algiers where he was a functionary, by an access of paludean fever of a mild type, it is true, but which from that time returned frequently and in such a way that he was obliged to send in his resignation and to return to France. His circulation was so imperfect that a cyanotic state of the whole cutaneous surface declared itself, accompanied by a general feeling of cold.

At the same time his legs were covered with a rough and thick skin which made one think it might be the beginning of elephantiasis. His condition slightly improved after his return to France, but after an influenzal attack the same phenomenon appeared with greater intensity, and his son, a medical student, who was sent for so as to be near, considered him as lost.

It was under those conditions that I applied the treatment by the high frequency currents, convinced that their beneficial action would not be long in becoming manifest. I did not have long to wait, as the day following the first sitting the patient declared to me that he felt really comfortable and had been able to get warm in bed. From the third sitting the patient felt hungry, a sensation which, as he said, he had not experienced for many years, and he assured me that he had eaten in one meal as much as he usually eats during the whole week.

The treatment was continued for two months. The cyanosis disappeared, and at the same time the sensation of cold ; the appetite remained as good as possible ; the vital forces became strong enough to allow the patient to take a walk of several miles, and this without feeling tired. At the beginning of the treatment he could only mount the steps slowly and painfully, whereas now he is able to go up with alacrity two at a time. In short, the arterial tension, which formerly was only 10 centimetres, now is raised and remains at 15 centimetres.

I saw that patient a few days ago: his health has remained satisfactory.

Those two observations triumphantly reply, it seems to me, to the fears manifested by Dr. McClure apropos of the application to the sufferers from hypotension of the high frequency currents.

Dr. McClure says, not without reason, that with such sufferers he prefers to apply static electricity. But I think that it is necessary to search for the real cause of that hypotension, and then it will be the duty of the physician to determine which sort of electricity he must employ to fight it.

If it be a question of an anæmic person, weakened by a long illness, or if it is a question of anyone whose brain has been overworked, or of a neurasthenic, one must have

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recourse to the static bath, to the Franklinisation with or without sparks.

But if one finds oneself in the presence of an arthritism, no matter in what form it manifests itself; if one finds oneself in the presence of senile weaknesses, whether there is or not hypertension or hypotension; in a word, every time that one meets trophic and vasomotor troubles, which are always consecutive whether from outside infections, or from auto-intoxications, one ought not to have the slightest hesitation: one must employ the high frequency currents.

As for the dangers of that treatment, if it is applied skilfully, allow me to declare to my friend, Dr. Reginald Morton, that, in spite of his fears, I consider these dangers to be absolutely imaginary. In fact, it is not a question of passing, as he says, a current of a thousand milliampères or more through a patient; that is not at all necessary, and perhaps might be dangerous; that which is all-important is to have a high tension apparatus capable of penetrating, of spreading, if I may use the expression, through all the patient's body, and in that case I think that a current of from 200 to 600 milliampères maximum is amply sufficient for producing the desired result.

With regard to the alleged danger resulting from too many sittings, I will reply by quoting the experiment made on myself in *corpore viti*. In 1902 I had 150 almost consecutive sittings, 120 sittings in 1903, and 80 last year, without having felt any other effect than a pleasant warmth which accompanied each sitting, and the satisfaction of not having since that time experienced any of those pains which used to annoy me so frequently, and which made me dread the possibility of myself becoming a gouty cripple.

I will add that I sometimes have had to apply long treatments to gouty people, amongst whom I may mention Dr. Rondeau, a friend of mine, who was almost entirely crippled for a great number of years, and who, since he began the treatment, less than a year and a half ago, has seen his articulations diminish and return to their normal condition, his circulation definitively re-establish itself, and in such a way that not only does he no longer feel the sensation of cold which was so painful to him, but he can without fatigue take long walks of several miles. In spite of that, he is not satisfied with the 140 *séances* which he has already had, and he still comes frequently to warm himself, as he says, by the beneficial heat of the electrical couch.

To-day the special action of high frequency currents on the vasomotor nerves seems to me to be sufficiently established by the physiological investigations of d'Arsonval, Apostoli, Montier, and many others, and by the clinical facts of which I have reported elsewhere numerous examples,

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so that there should be no doubt in the future regarding this.

For us to disagree in our views on this subject is to give a handle to the criticism of those (and they are numerous) who, relying on such differences more apparent than real, draw unflattering conclusions about electrotherapy, and those who thoughtfully and honestly practise it.

NOTICES OF BOOKS.

RADIOTHERAPY IN SKIN DISEASE. By Dr. J. Belot, with a Preface by Dr. L. Brocq, Physician to the Broca Hospital, Paris. Translated by W. Deane Butcher, M.R.C.S., Surgeon to the London Skin Hospital. London: Rebman, Limited. 1905. (New York: Rebman Company.) Medium 8vo. 463 pp., 13 plates, 24 figs. Price 17/- net.

This translation of a standard French work will be welcomed by English readers, as it puts into their hands in a convenient form a most excellent work of reference on the subject of X-ray therapeutics.

No English author has hitherto dealt with this special branch of work, and this makes the translation of Dr. Belot's book the more acceptable.

The plan of the book includes the theory and methods of production of X-rays, the history of the physiological and pathological effects of radiotherapeutic applications, and the details of the treatment to be followed in dealing with a large number of diseases by X-ray methods. Full accounts are given of the work done by Belot and others in the various forms of cutaneous disorder in which X-rays have proved useful. The action of X-rays in sarcoma in cancerous diseases and in rodent ulcer is described at length and their employment in tubercular diseases, in leukæmia and lymphadenoma, and in numerous other morbid states is referred to and discussed in a scientific manner. The translation is well done, and the general appearance of the book is attractive. The paper, the printing, and the binding all contribute to this result.

A copious bibliographical index is appended, but there is no index of contents, and we may hope that the translator will see fit to compile one for the convenience of readers of a future edition.

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NOTES AND ABSTRACTS.

Treatment of Arterio-Sclerosis by D'Arsonvalisation.—Dr. A. Montier reports: We have established that electricity provides in d'Arsonvalisation the means of reducing the arterial pressure and securing a return to the normal in cases of permanent hypertension. We propose to condense in this article the work which we have published elsewhere upon this question.

There is a peculiar interest in reviewing the various phases through which we have passed. At the beginning of our researches we had a constant amelioration which we attributed to this mode of treatment, but the amelioration was much more of a subjective order.

We have nothing that will permit us to control the manifestations of the disease. The effort to devise a better treatment was continued over a long period, and at longer or shorter intervals we have published our conclusions.

In 1899, in our first work, we stated that our researches had not enabled us to obtain satisfactory results by the employment of d'Arsonvalisation alone. But if the arterial hypertension had been of long standing a combination of hygiene and dietetics with d'Arsonvalisation would cause the disappearance of the most persistent arterial hypertension.

"The results are not immediate; a lessening of the arterial pressure is not obtained by one sitting of d'Arsonvalisation. The result is prolonged; the reduction of the arterial pressure is progressive."

Again in 1902, at the Congress of Berne, we were able to speak more positively: "Of the new observations mentioned by us, we were able to positively affirm that we have secured cures when the disease is under treatment a sufficient length of time, and if the state of the patient justifies a favourable prognosis we have always obtained at least considerable amelioration."

In a certain number of selected cases we have secured, after a single sitting, a reduction in the arterial pressure of 1 to 2 centimetres of mercury. The pressure would rise a little later, and generally returned to its original normal state little by little. At each new sitting the reduction in pressure was definite and sure.

Finally, in 1902, we succeeded in securing absolutely satisfactory results, which we will explain in this article.

It appears necessary to go over the causes of results so diverse obtained at these various epochs. This will enable us to comprehend the honest differences of opinion entertained of the value of d'Arsonvalisation.

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The inequality in the good results obtained have been taken as a standard to measure the value of the apparatus of d'Arsonvalisation.

Before 1899 our apparatus was formed of a coil with a 25 centimetre spark, a rapid interrupter connected to a battery of eight accumulators furnishing 16 volts of electricity; the coil was relayed to a condenser formed of two Leyden jars, the latter in communication with the large solenoid.

We now replace the rapid interrupter by the d'Arsonval-Gaiffe rotative interrupter and the condenser of Leyden jars by the d'Arsonval condenser. The results of this apparatus are much better, and, in favourable cases, a slight reduction in pressure has been secured by a single sitting.—From *Archives d'Electricité Méd.* R.H.C.

* * *

Treatment of Keloid by the X-ray.—Moseley reports a case of a man thirty-five years of age who, in 1900, had a nævus of the right cheek removed. A keloid appeared, and on February 15th, 1903, the patient presented a keloidal mass about 4 inches long running downward and forward on the cheek. In all twelve treatments were given, extending from February 15th to May 19th, exposures to the X-ray being of ten minutes' duration and employed three times a week. On May 15th an erythema began to appear, the skin became inflamed, and the keloid quite flattened. The patient could now shave himself with perfect freedom. The colour had changed from red to white, and the sensitiveness, which had been at first very marked, had entirely disappeared.—*Med. Record.* R.H.C.

* * *

Recent Advances in Electrotherapeutics.—The special topics considered by W. J. Morton are the Röntgen ray, radium, and artificial fluorescence of living tissues. The X-ray has greatly increased the percentage of cure in cancer. Superficial growths are most likely to be permanently cured. Not much has been done for the disease when located in internal organs. Some cases of gastric cancer may be cured if the growth is of a superficial type. The same statement holds true of some cases in the upper respiratory region. Some cases of uterine disease have been cured, while the progress of many has been retarded. The same general statements may be made with regard to radium. Concerning both, it may be said that they ought to be used both before and after operation. With regard to the fluorescence of living tissues, the author has used quinine, æsculin, and

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fluorescin, the latter being particularly good owing to its non-toxic properties. He uses this method for tuberculosis, lupus, tubercular glands, etc. Cases of chronic malaria have not been benefited. In one case, in which two abscesses containing amœba coli had been opened, and in which it had been proposed, in order to stop the progress of the disease, to open the colon and inject ice-water, the micro-organisms have been completely destroyed. Morton also notes that if we administer to a patient twenty drops of an aqueous solution of fluorescin, one part of fluorescin to thirty of water, and say, forty minutes later on, make an X-ray exposure to a photographic plate, we obtain a radiogram of superior contrast and definition. In a similar manner, fluoroscopic examination of the patient, particularly of the thorax in tuberculosis of the lungs, is greatly aided.—*N. Y. Med. Journal.*

R.H.C.

* * *

The X-ray in Inoperable Malignant Disease of the Orbit.—C. S. Bill says that while malignant disease of the orbit, which has apparently not originated in or involved the adjacent sinuses, should be extirpated by the knife as soon as possible, the consensus of opinion seems now to be that when the neighbouring sinuses are involved a complete removal of the growth is impossible, a recurrence of the growth is certain to appear, and with each repetition of the operation the return of the disease is hastened, and the life of the patient is by just so much shortened. On the other hand, in view of what we actually know of the action of the X-rays, it would seem not only wise, but our duty, after such operation by the knife as may be necessary, to expose the parts a certain number of times to the X-rays, in order, if possible, to destroy isolated cells, or aggregations of cells, in the neighbouring parts, which cannot be reached by the knife. It is stated on good authority that there has been a marked diminution in the death-rate following operations on patients so treated. The author's experience, based on his own cases, has satisfied him that the X-rays are of value in removing the pain so constantly complained of, and he therefore believes that the treatment is to be recommended in inoperable cases because it relieves much of the patients' suffering, and thus may prolong their lives. It would seem that the more recent and superficial a malignant growth is, the more rapid and favourable are the results from X-ray treatment, but it takes time to prove the ultimate good results. The author presents the detailed reports of ten cases from his own private practice, in which the X-ray treatment was employed after excision by the knife. Of these ten cases two were very much improved, if not

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apparently cured; and of these two, one was an epithelioma and the other a carcinoma. The remaining eight cases, in which no demonstrable effect was produced by the X-rays, were all sarcomata. In all but one of these the pain was more or less effectually relieved. No untoward results of the action of the rays were observed in any of the cases.—*Med. Record*, June 24th. R.H.C.

* * *

Effect of Röntgen Rays on Non-Suppurative Tuberculous Adenitis.—I. Valobra, of Torino, has treated three cases of non-suppurative adenitis by the Röntgen ray, using a hard tube, at a distance of 30 to 40 centimetres from the region to be treated, protecting the surrounding skin by an aluminium shield. He found that after each sitting there was a marked reaction, characterised by fever, swelling of the affected glands, and general symptoms, lasting some days. These symptoms were immediately followed by a rapid absorption and decrease in the size of the glands. The result of ten to twenty treatments was a marked decrease in the size of the glands, and reduction of the deformity caused by them. In X-ray treatments the skin reactions do not appear until some time after the applications, but in treatment for cancer of the internal organs, and for leukæmia, these phenomena of severe reaction are observed, accompanied by rapid diminution in the size of the growth. The author questions whether such action will be followed by a generalisation of the tuberculous infection. Sufficient time has not elapsed to decide this question. The Röntgen ray in bearable strength does not kill the bacilli of Koch. The author thinks that in undoubtedly tuberculous glands it is well to avoid a violent reaction, giving short sittings, and mild treatment, so as to avoid the chance of causing generalisation of the infection. R.H.C.

* * *

Electricity for Chronic Constipation.—Harney gets admirable results in the treatment of chronic constipation with galvanic or static electricity. For galvanic current 15 to 20 milliampères, interrupted 120 times per minute, are used; two hand sponge electrodes, wet and soaped, 3 inches apart, are passed over the colon in the direction of the passage of fæcal matter for five minutes; then the position is placed over the liver, negative mobile as before for two and a half minutes; then positive to stomach, negative as before for two and a half minutes. For static the singing current is used, with patient on side of chair on insulated platform, metallic electrode

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introduced into anus, attached to positive pole, negative pole grounded; conductors are gradually separated until 6 or 8 inches apart; regulate speed so as to give 120 sparks a minute.

This treatment overcomes the atonic condition of the muscular coats of the intestines and this cures the constipation.

R.H.C.

* * *

The Treatment of Wounds with Ultra-violet Light.—Axmann says that a certain amount of confusion has been introduced into the study of radiotherapy by the inexactness of various observers who have not been careful to differentiate between the effects and sources of heat, light and chemical rays. He warns against attempts to produce results by the use of variously coloured light filters, and says that progress must be made by developing sources of light which shall produce rays of the sorts desired. He considers that the mercury vapour lamp is a very important advance, as it produces no red rays, but an excess of blue and ultra-violet rays. The rays of this lamp have marked irritating, vaso-dilating and bactericidal properties, and the author has used them with success in cases of alopecia, chronic eczema, acne, sycosis, erysipelas, etc. They also manifest a strongly oxidising action on venous blood, and the author describes very encouraging results obtained in cases of varicose ulcers exposed to their action. He recommends a further application of the method to all open wounds or ulcerating surfaces, all of which are said to be greatly benefited by the active oxidation produced.—*Münchener medizinische Wochenschrift,* September 5th, 1905. R.H.C.

* * *

In a letter to the *Medical Record* under the date of October 15th, 1904, which was published in the issue of December 3rd of that year, mention was made of an interesting experiment that was being conducted at the San Lazaro Leper Hospital, in the treatment of a certain number of lepers with the X-ray. Particular mention was made of a case in a male adult who had a leprous infiltration of the left ear, which enlarged it to the extent that its long axis measured 4 inches, while the ear on the right side, which was normal, measured only about 2 inches. A few weeks of treatment with the X-ray reduced it to normal size, and at the same time other leprous symptoms began to disappear. We now have the subsequent history of the case :—

The X-ray treatment was continued for about one month longer, with the result that the outward physical evidences

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of the disease disappeared entirely. The change in the affected ear was truly remarkable, in fact, it would have been impossible for the casual observer to see any marked difference in the two ears. The man, however, soon afterward showed evidence of chronic illness. He began to lose weight, and he would voluntarily spend a good portion of his time in bed. During April he began to decline rapidly, and in the early part of July he died.

A very careful post-mortem examination was made, which showed that he had marked atrophy of the liver, and death was in all probability due to that cause. Many sections of tissue were taken from various parts of the body and stained for leprosy bacilli, but so far none have been found. The diagnosis of leprosy, upon his entrance into the hospital, was confirmed by at least three different physicians, and two independent observers found leprosy bacilli in scrapings taken from lesions on the head and face.

From the foregoing it would appear that there can be but little ground upon which to question the original diagnosis. Further experiments are being made with the X-ray in other cases, and the result is awaited with a great deal of interest.

R.H.C.

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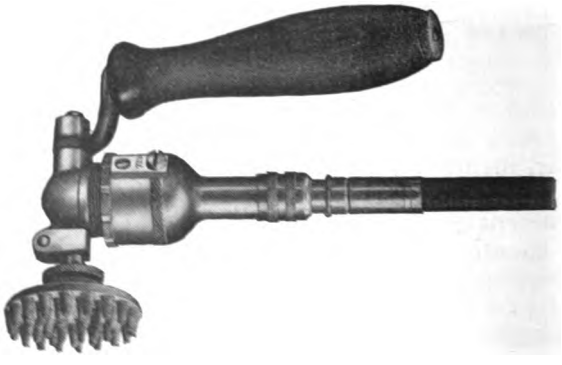
One of the most interesting demonstrations at the recent Medical Exhibition was the Mechanical Vibrator shown by Mr. Barker, of Regent Street. This machine is far in advance



No. 1.

of any we have yet seen and presents several special points of interest: the motor is of slow speed, high speed in vibration being attained by mechanical means. The machine is exceedingly fast, being capable of giving 20,000 movements

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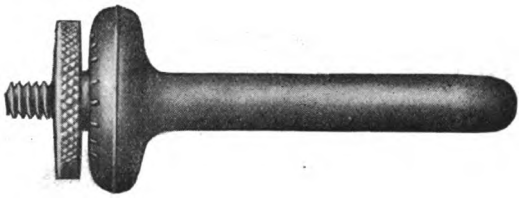
per minute, and yet it can also be run at quite low speed. The movement is practically noiseless and no vibration is imparted to the handle. The most interesting point about it,



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however, is the ingenious mechanical contrivance in the handle which combines the movement of kneading with that of vibration. The illustrations represent: No. 1, the handle

No. 3.

with a rubber application in position; No. 2, nasal applicator; and No. 3, a rubber cup applicator which has the dry-cupping effect in addition to the kneading and vibratory movements. We have had opportunities of testing this machine on patients with very gratifying results. R.H.C.

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PART II.

PROCEEDINGS OF THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

Edited by REGINALD MORTON, M.D., *Secretary.*

The Thirty-second Ordinary Meeting of this Society was held at 11, Chandos Street, W., on Friday, October 27th, at 8.30 p.m. The President, Dr. DONALD BAYNES, in the Chair. There were present twenty-two members and one visitor.

The minutes of the Provincial Meeting at Leicester were read and confirmed.

Mr. CHISHOLM WILLIAMS showed two cases of recurrent carcinoma of the breast and one case of adeno-sarcoma of the thyroid, all treated by X-rays. These cases were very successful, especially the thyroid.

Case No. 1.—Woman, aged 64. She attended at St. Georges' Hospital in March, 1899, for a tumour in the right breast, was admitted under the care of Mr. J. W. Haward, who removed the breast, containing a scirrhous carcinoma. In July, 1901, there was a recurrence in the scar and axilla, for the relief of which she was operated upon by Mr. H. C. Jeffreys. Six months later, in December, 1901, Mr. Clinton Dent removed several lumps from the right axilla. The patient remained free and well for nearly three years, but in March, 1904, she saw Mr. L. A. Bidwell at the West London Hospital. There was then found to be one small ulcer at the inner end of the scar and several lumps in the scar and the axilla which were adherent to the skin and the underlying tissues, also there was great œdema of the whole of the right arm which had persisted for the past eleven months. Microscopically, the ulcer proved to be epitheliomatous. X-rays were applied twice a week for five to ten minutes, the ulcer readily healed and the lumps one by one broke down and became simple hæmatomas; these were from time to time

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tapped and yielded disintegrated blood, the small incisions healed rapidly. In June, 1904, treatment had to be stopped for a somewhat extensive dermatitis, it was resumed the following August. From that time onwards she has shown no sign of malignancy, but has had intermittent treatment with the idea of softening, if possible, the lumpy scar in the axilla, thus relieving the œdema of the arm, which still persists though much improved. Even now a lump will break down and the contents on aspiration consist as before of disintegrated blood, but with no trace of carcinoma cells. The patient has gained 18 pounds in the past sixteen months. She has practically no pain except from the dragging of the scar, and is in a good state of general health.

Case No. 2.—Woman, single, aged 39. She attended at the Westminster Hospital in September, 1902, where Mr. E. P. Paton removed the left breast for a scirrhous carcinoma, and, according to her statement, "it never healed completely." In June, 1903, she consulted Mr. L. A. Bidwell at the West London Hospital, who diagnosed the affection as recurrent carcinoma with infected axillary glands. There were four lumps in the scar, three of which were ulcerated in their middle, each the size of a penny and slightly raised; they were adherent to the deeper tissues, the lumps in the axilla were not very hard, but each was the size of a walnut, and there was also a supraclavicular gland of the same size. The treatment by X-rays was commenced on the 15th of June, 1903, and consisted of ten-minute applications given twice a week at a distance of 3 inches from the parts, which were completely bared. After the ninth sitting a severe dermatitis was produced; the size of the area, which ultimately peeled, was 8¼ inches by 7, it was the whole of the breast axilla and upper third of the inner side of the arm; this gradually subsided, and then it was found that the ulcerated lumps had all disappeared. On the 14th September I resumed treatment on the axillary lumps, carefully screening the healed parts. She had sixteen applications in all during a period of four months. During the past two years there has been no sign of a recurrence, the scar is very loose, and at the situation of the

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ulcers the skin is peculiarly thin and transparent. The axillary and supraclavicular glands cannot be felt.

Case No. 3.—Male, aged 52. Storekeeper, Woolwich Arsenal. In May, 1904, he was sent to Mr. L. A. Bidwell, at the West London Hospital, for an enlargement of the right thyroid. He complained that it had grown during the past eleven weeks to the size it then was, that of a large orange, painful to the touch, with sharp neuralgic-like pains at all times. It was not cystic, and was diagnosed on account of the rapidity of growth and peculiar pain to be an adeno-sarcoma. The X-rays were applied for eleven sittings of ten minutes each during three months, the tumour disappeared gradually and all pain ceased. The patient presents the slightest thickening of the right lobe of his thyroid.

Comments were made by Drs. G. B. Batten, A. D. Reid, R. H. Cooper, D. Arthur, and the Secretary. In reply Mr. CHISHOLM WILLIAMS said: Undoubtedly œdema of the arm in such cases is due to either pressure from growth or contraction of the scar. In the first case it must be from the contraction of the scar, as it has lasted nearly two years. It is still contracting, as at first the inner end was just on the mid-sternal line and now is $3\frac{1}{4}$ inches from that mark. The gain in the weight is a healthy sign.

In the second case the supraclavicular gland was a dangerous sign, as cases seldom give much hope when they are infected; but in this particular patient I consider that the gland was not infected but most probably only inflamed.

The goitre case was proved to be non-cystic with a hypodermic needle. The diagnosis was based on the rapidity of growth and the great pain; it also behaved to the treatment like most sarcomas.

There were no toxic symptoms observed in any case, probably owing to the two or three days' interval between each application, enabling the patients to recover from each successive toxic dose. In other cases of cancer I have frequently observed toxic symptoms with X-ray treatment.

My usual custom is to have from the alternating main about 30 volts, with 2 to 3 ampères in the primary, and the

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tube at a distance of about 3 inches from the skin, always using very hard tubes. In the first and second case the dermatitis was produced immediately after using a new soft tube.

A discussion was then opened on the attitude of this Society in regard to the proposed union of medical societies. The Secretary, in the unavoidable absence of Dr. Lewis Jones, read on his behalf the following resolution: "That the British Electrotherapeutic Society is in favour of joining the proposed union of medical societies, but would like to see the establishment of a special Electrotherapeutic or Physiotherapeutic subsection in such an united society, for the reason that such a subsection would be a meeting-place for members interested in a well-defined sphere of medical work." This was seconded by the Secretary and carried unanimously.

Dr. DEANE BUTCHER then read his paper on "The Rationale of Radiotherapeutic Treatment."

Discussion by Drs. McClure, Batten, Manders, Worrall, and the Secretary.

Dr. BUTCHER replied.

A hearty vote of thanks to Dr. Deane Butcher was proposed by the Secretary, seconded by Dr. McClure, and carried unanimously.

The meeting then closed.

NOTICE.

Members taking part in discussions or making remarks on papers, etc., are earnestly requested to give their notes on same to the Secretary at the end of evening, so that the proceedings may be complete and not delay the prompt publication of the Journal.

PUBLICATIONS.

17.—The proceedings shall be published in such a manner and at such times as the Council may direct. A copy shall be forwarded to each Honorary and Corresponding Member of the Society, and to every Ordinary Member whose subscription is not more than one year in arrear. Fourteen days' notice should, whenever possible, be given to one of

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the Secretaries by any member who wishes to show a clinical case or to make a communication to the Society. A copy of the paper in a form fit for publication in the proceedings must be furnished at the same time. The paper shall be the property of the Society for publication in the proceedings, without prejudice to the author's right to reprint or insert in any recognised medical paper or periodical. In all such cases the author shall state that the paper was read before the Society.

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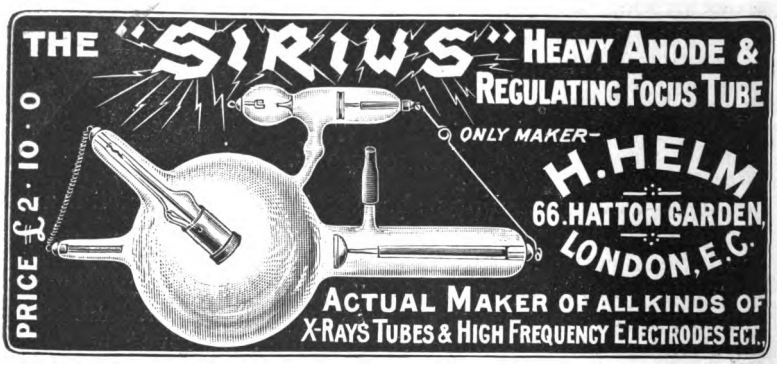
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MEDICAL

Electrology and Radiology.

No. 12. DECEMBER, 1905. Vol. VI.

EDITORIAL.

The publication by Mr. Butlin of a paper, entitled "Cancer is a Parasitic Disease," is indicative of the constant recurrence in medical thought of the idea of cancer as a parasitic disease. Mr. Butlin, however, goes further than other writers have gone, and would have us believe that there is a possibility of cancer being not only the product of a parasite but actually the parasite itself. He instances the fact that cancer is inoculable even after it has been removed from the body for some time. That a surviving tissue should retain the power of once more taking on active growth after return to conditions favourable for nutrition is not in any way surprising. The heart of the lower animals will continue to beat for days after excision, and if properly supplied with oxygen the heart of a warm-blooded animal will also continue to beat for almost as long a period.

This observation only shows that cancerous tissues have a considerable amount of autonomy, but there is evidence that this is only partial. For instance, Cheatle has collected a number of instances of carcinoma of the skin in which there is very distinct evidence that there is a barrier to the passage of cancer of the skin from the area supplied by one cutaneous nerve to that supplied by the next. This obstacle is by no means insuperable, but there can be but little doubt that the tendency to remain at first restricted to a definite nerve area exists.

This points to the autonomy of a cancer cell not being absolute.

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It is very hard to believe that an independent organism from without could have the power of reproducing with such accuracy of detail the various cellular elements of the tissue from which it grows, producing prickle cells when it grows in the neighbourhood of prickle cells, and columnar cells when in proximity to cells of the alimentary tract. We fear that a great deal more evidence must be brought forward before this theory can demand serious consideration.

Reversion to the parasitic theory seems to be an instinct of man, probably allied to the mediæval idea that any mental disorder is due to the installation of a demon in the body of the afflicted person. Mankind seems to dislike the idea that he himself can produce in his own body the instruments of his own destruction without the aid of extraneous beings—bacteria, cancer parasites or demons.

The work of Farmer, Walker and Moore on the minuter cytology of cancer has thrown a flood of light on this vexed question, and although they are far from showing as yet the cause of cancer, they have progressed further along the path than any other observer.

Their identification of the Plimmer body of the cancer cell with the portion of the cell in the mother cell of the spermatozo on which forms the cephalic cap is, perhaps, the severest blow the parasitic theory has yet received.

Faradic Treatment of Urinary Incontinence.—This method of treatment is particularly effectual in children, and especially in those who have had incontinence from the earliest infancy. Of forty subjects, fifty-five per cent. were cured by Genonville and Compain, and sixty-three per cent. of the children between 6 and 12 years old. The sittings numbered from five to eight in the "congenital" cases, while the others required six to sixteen, with the exception of five, who had twenty to twenty-nine sittings. Improvement during the first week, even if slight, is a favourable sign that a cure will be attained finally. The electricity may be applied directly to the sphincter or to the region. All but twenty per cent. of the subjects were improved or cured, and in sixteen a complete cure was realised in a maximum of sixteen sittings.—*La Presse Médicale*, No. 38, 1905. R.H.C.

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THE DIAGNOSIS OF PULMONARY TUBERCULOSIS BY X-RAY EXAMINATION OF THE THORAX.*

By A. STANLEY GREEN, M.B., B.S. (Lincoln).

(Read at Leicester, July, 1905.)

The early diagnosis of pulmonary tuberculosis is a matter of such vital importance that any method of examination that can help us to make it more certain should have a fair trial, and yet, up to the present, this subject has for some unexplained reason been much neglected by the majority of general practitioners.

My experience, since I first commenced to make a study of lung radiography five years ago, is that a very large number of cases are not recognised until all hope of effecting a permanent cure has been lost, or if recognised the necessity of devoting all the patient's energy to fighting the disease is not sufficiently brought home to him or his friends. Many a patient in the early stages of the disease feels so well that he or she refuses to believe that such a radical measure as leaving home and work and living in the open air for three or six months on account of a slight cough is necessary, and they begrudge not only the money but the time that must be spent, with the result that the matter is temporised and valuable time is lost, never to be recovered; but show one of these patients or their friends a skiagram of the chest and you will no longer have any trouble in persuading them to adopt the measures you suggest and, moreover, they will not require a second opinion.

I am most firmly convinced myself that not only can the disease be detected earlier and with more certainty by this method of diagnosis, but that the extent of the mischief can be gauged and in many cases will be found to be greater than the physical signs denoted. In some cases, as I shall show later on, both sides were found to be diseased, when the physical signs had led the physician to believe that one was quite healthy. The value of this will, I think, be conceded by even the most prejudiced, and especially is this so in the case of a sanatorium like Kelling, where we send so many of our Lincolnshire patients, where they only like to admit very early cases, *i.e.*, cases that are diagnosed from symptoms alone or from an early hæmoptysis, no physical signs being

* We regret that the illustrations for this article could not be obtained in time for this issue; they will appear in our January number.

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elicited or if physical signs are present then the mischief must not involve more than the whole of one lobe or part of two.

It is also possible, by examining the patient at intervals, to follow the progress of the disease, and this I will show you by three skiagrams of a patient taken at different periods of the disease. Normal lung tissue is very translucent to the X-rays, and it is therefore quite easy for the expert to detect any departure from the normal condition, but it requires a good deal of experience to interpret the various conditions met with and to give them their correct clinical value.

Not only must the condition of the lung tissue be carefully studied, but the slope of the ribs and the width of the intercostal spaces and the height of the diaphragm on the two sides must be compared. The diaphragm is always higher on the right side than the left and this difference varies from ½ to 2 inches.

It must be distinctly understood that the patient's history, symptoms and physical signs must be taken into consideration with the evidence obtained from the X-ray examination before an opinion can be given on any case.

The method of examination is twofold :

1. Screen.
2. Skiagram.

By means of the screen the movements of the diaphragm can be accurately measured, and I am satisfied that it can be laid down as an absolute law that " Unilateral limitation of movement of the diaphragm is the earliest known sign of pulmonary tuberculosis " (of course allowances must be made if the patient has had pleurisy). This limitation of movement is very striking and cannot fail to be noticed by even the most casual observer. The movement of the diaphragm in health is generally of a plunging character like a piston of the maximum excursion (*i.e.*, deep inspiration and a deep expiration), averages 2⅝ inches on the right side and 2⅜ inches on the left, whereas in quiet respiration (minimum) it averages ½ inch on both sides, any deviation from the normal is therefore easily detected.

The movement of the diaphragm may vary not only in extent but also in character, in some cases whilst it is seen to plunge up and down on the healthy side, on the diseased side it is seen to hesitate and only descends by stages, or it may descend to its lowest point with one movement and yet return to the position of deepest expiration by a series of jumps (stammering or cogwheel). This may be seen either when looking with the screen at the back or front or in both positions, and the patient must always be examined in both positions. Dr. David Lawson was the first to call attention

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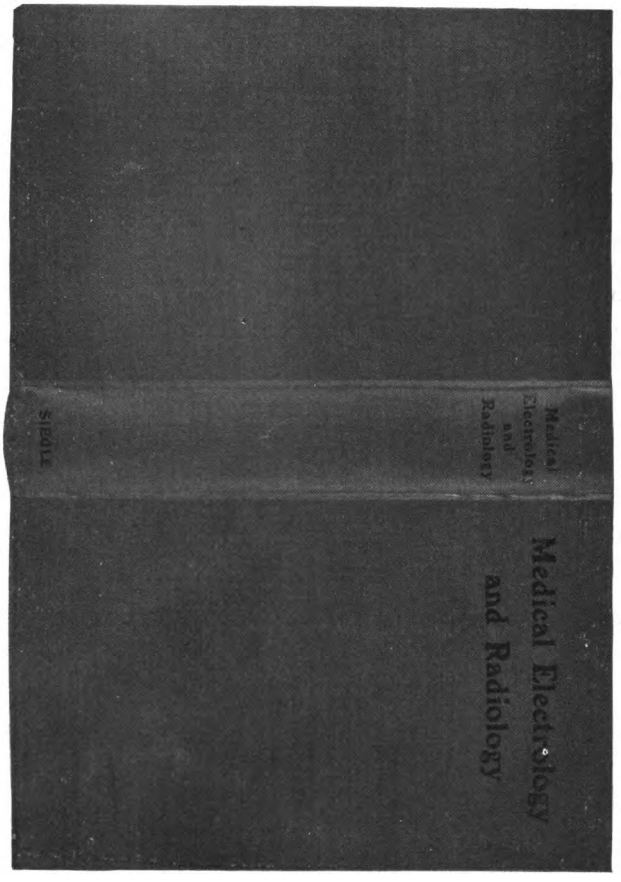

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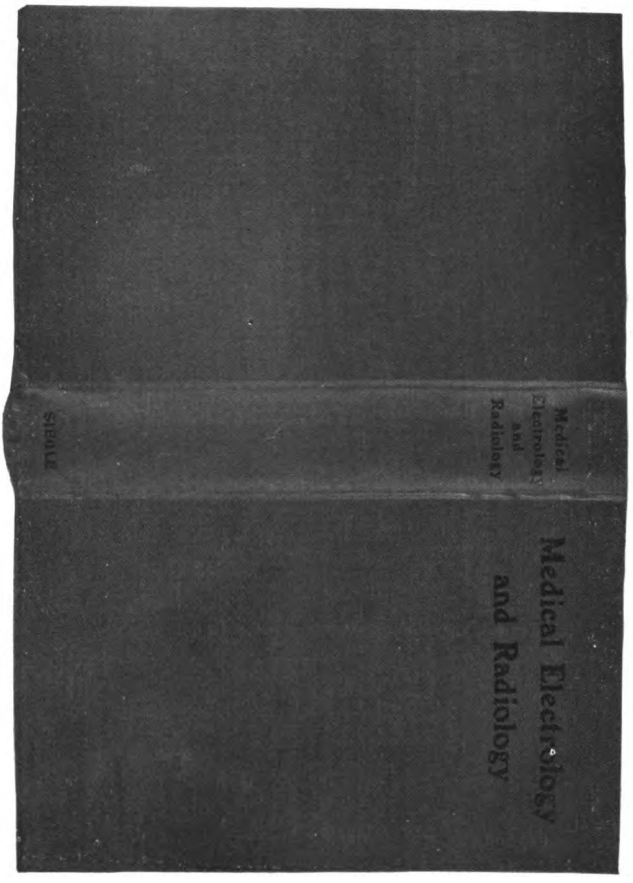

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to this in a paper read before this Society in March, 1904, where he discussed what he termed "Associated Movements of the Diaphragm," showing that where consolidation was apparently more marked towards the posterior aspect of the lung, the amplitude of the range of movement of the diaphragm towards the back, as measured by the screen, was considerably less in extent than the amplitude at the front. Furthermore, the relative level of the diaphragm on the affected side as compared with that on the unaffected side as seen from the back was higher than that observed at the front. Thus in one case, where the shadow of the apices of the two lungs was most marked at the back, the right lung being more affected than the left, during deep breathing the range of movement at the back was exactly one-half as seen at the front.

A little experience is necessary to detect the shadows cast by consolidated lung tissue on the screen in the early cases, and sometimes it requires the sensitive plate to bring out the finer shadows, but in cases where a large area is involved it is quite possible to determine the whole extent of the disease by a screen examination alone.

Figs. 1, 2 and 3 will show how easy it is to diagnose between fluid in the pleural cavity and consolidated lung tissue. Fig. 1 shows complete consolidation of the entire left lung of a patient aged 60; Fig. 2 was taken with the patient (a case of pyo-pneumo-thorax) in the horizontal position; and Fig. 3 in the upright position the change in the level of the fluid is well shown.

It is a well-known fact that a large number of pleural effusions are tubercular in origin, and in a certain percentage of them the lung tissue is either attacked at the same time or later, and I hold that in these cases the physician is able to detect the disease in the lung tissue earlier and with more certainty by means of an X-ray examination than by the ordinary methods of diagnosis. I have been able to demonstrate the presence of the diseases in the lungs in several cases before it was apparent to the ordinary methods of diagnosis. I will give you particulars of two cases: the first was a youth aged 19, who was sent to me complaining of lassitude, etc. There was nothing definite to be found by the ordinary methods of examination, but on placing him before the fluorescent screen I was at once struck by the fact that the right side of his diaphragm was almost motionless even in deep inspiration, whilst the left side moved freely. At this examination no shadow could be detected by the screen or plate, but a fortnight later a shadow could be seen below the right clavicle; a month later there were distinct physical signs in this region, but now there was limitation of movement on the left side also and, moreover, a shadow could

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be detected below the left clavicle, in the skiagram. In spite of all treatment this patient rapidly lost ground and died within nine months of the first examination. The next case was a patient aged 48, who was sent to my partner, Dr. H. Brook, for a diagnosis, with the history of several small hæmorrhages from his lungs without any physical signs of tubercle or aneurism. On examination with the screen I found that the range of movement of the diaphragm as seen from behind was less on both sides than when viewed from the front, but was more limited on the right side than the left, and in the right apex there was a very definite shadow to be seen. In the skiagram, Fig. 4, it was seen that the shadow in the right apex was more extensive than the screen examination had led me to suppose, and the left apex was certainly not free from disease.

The next point that I wish to draw attention to is that in many cases where the physical signs point to the disease being present in one lung only, yet the X-ray examination proves beyond the shadow of a doubt that there is consolidation in the other lung also. Fig. 5 was taken from a case of this description. The patient, a man aged 58, sent for me to see him on account of loss of flesh and a troublesome cough, there where physical signs on the right side pointing to extensive consolidation in this lung, but none on the left side, and this was confirmed by an experienced physician. The skiagram shows extensive disease on both sides.

Fig. 6 was taken from a woman aged 25, who had been told that she had some slight mischief in the right lung, but the left was quite sound. This patient was very sceptical about her condition being serious until I showed her the skiagram.

Where the patient has had a sharp attack of hæmoptysis it is very often possible to detect the site of the hæmorrhage, and this is seen in Figs. 7 and 8; the first was taken two and a half years before the second, which was taken three weeks after a very severe hæmorrhage, the dark shadow extending from the fourth to the sixth rib close to the spine not being present in the first or any other skiagram taken at varying intervals.

I have always thought that it would be possible to make an absolute diagnosis in a case of acute miliary tuberculosis of the lungs, but it was not until Dr. Wilkinson, of Gainsborough, sent us G. A., aged 7 years, for a diagnosis that I was able to put this to proof. The child had been ailing for about eight months, but had had an attack of bronchitis complicated with a right pleural effusion, in Jan., 1904. I saw him in April of the same year, and immediately he was placed in front of the screen the lungs were seen to be mottled all over with areas of shadow, as seen in Fig. 9.

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No physical signs could be detected in either lung, yet he died July 4th, having developed signs which left no doubt in the mind of his medical attendant of the cause of death.

Figs. 10, 11 and 12 illustrate how the progress of the disease can be watched by means of skiagrams. They were taken from a patient who came to me complaining of a troublesome cough only when he came out of the malthouse, and on examination I found that he had extensive disease in both lungs, but the area I wish to call attention to is the apex of the left lung. In Fig. 10 (Feb., 1903) the opacity is homogeneous; in Fig. 11 light areas have appeared in the opacity (six weeks later) denoting cavitation, and this agreed with the physical signs; whilst in Fig. 12 (six months later) this area is to be smaller and quite circular in outline movement, moreover this outline is sharply defined, and I feel confident that this is a condition of fibrosis, a result that must be looked upon as extremely favourable in a case where the involvement of lung tissue was so very extensive.

The technique presents no difficulties. I always use Lumière plates, a heavy anode tube, and working with my present instalment Gaiffe-d'Arsonval transformer I employ from 80 to 90 volts 3 amps. and about 1·5 m.a. in the secondary, and give an exposure varying from thirty to sixty seconds, according to the thickness of the chest. The plate-to-back method is always used, the advantages outweighing the disadvantages, and the patient is radiographed in the sitting position, I find that they are less likely to cough. The anode is placed 20 to 24 inches from the plate opposite a point on the sternum, on a level with the fourth costal cartilage if both lungs are to be taken on the same plate; if, however, a separate plate is used for each lung then the anode is placed on a level with the third rib in the nipple line. I am sure that better definition is obtained if two plates are used, but the expense is doubled. The exposure must be kept well within bounds, overexposure being fatal to anything approaching a good result, whereas a fairly good negative can often be obtained by thorough development of a moderately underexposed negative, but the medical man ought to develop all his own plates if he wishes to get uniformly good results.

I use a hydroquinone developer, and a plate requires about fifteen to twenty-nine minutes in the fluid; I have not yet tried a stand developer, but intend to give glycin a trial this winter during the busy months.

I feel sure that any medical man taking up this branch of radiography will never regret it. The examination of the patient does not occupy much time; with a little experience ten minutes will be found to be sufficient in which to carry out a thorough screen examination and expose one or more plates.

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From my experience I have come to the following conclusions:

1. That the disease can be detected earlier by this method of examination than by any other.

2. That unilateral limitation of movement of the diaphragm is the earliest known sign of pulmonary tuberculosis.

3. That this can be seen and accurately measured by a screen examination.

4. That the extent of the disease can be gauged with more accuracy and is often found to be greater than the physical signs lead the physician to suppose.

5. That the progress of the disease can be watched.

Dr. HALL-EDWARDS: Mr. President and Gentlemen,—I am sure we are very much indebted to Dr. Green for his valuable demonstration. For the last 9¾ years I have had the work of examining chests. I am not quite sure that I think it should form part of a medical man's outfit. The work needs a great deal of experience. I think probably that if some medical men took up the study of the chest in connection with X-rays they would have better results. I find there is a difficulty in making a diagnosis of these things; it becomes really a matter of reading your skiagram correctly; it is a difficult thing to do, and takes years to become properly fitted for the work. I think that Dr. Green has given us a proof of its usefulness, and I hope that it will be brought before physicians, and that they will take it up and utilise it to the best advantage. I am sure that the application of X-rays, together with the study of the subject from the other point of view, would enable them to do their work much more accurately. There are several other branches in which they could be helped by this means. I am sure that Dr. Green should receive the thanks of this Society for the very able and energetic way in which he has dealt with this subject.

Dr. LEWIS JONES: Mr. President and Gentlemen,—I should like to say a few words on this subject. My own experience is that it is perilous for any one to undertake the work without full knowledge and experience. From time to time, when subjects are being discussed by medical men, I have felt appalled to think that physicians should get up and say that they are unable to see that X-rays are of any use. I have long held that the X-rays should be used in cases of early phthisis a little earlier. I think so certainly now. I am very glad to hear Mr. Stanley Green boldly assert that fact. In some cases where there had previously been no sign of disease the X-rays showed disease from top to bottom.

Dr. J. S. BOLTON: Mr. President and Gentlemen,—I should like to thank Mr. Stanley Green for his very interesting paper, and would like to ask him a question with regard to the way in which he manages the breathing of the

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patient while under exposure. It is most important to understand how that is managed. Is it possible that if, say, a child breathes at all freely the shadows of tubercles are passed up and down? Then, again, it seems to me that the length of exposure is so exceedingly important in these cases, that if the case is exposed a little longer than usual the shadow may disappear from the radiogram.

Dr. D. ARTHUR: Mr. President and Gentlemen,—I must congratulate Dr. Stanley Green on his splendid paper. I think that physicians are realising more the importance of this branch of electrical work. I have spent a pretty good deal of time in the X-ray room in attempting to make diagnoses of these cases. These skiagrams that Dr. Green has shown us are evidently of very good quality. He is of opinion that it is better to underexpose than to give a prolonged printing, and that medical men should print their own negatives. I quite agree, for I know that when our skiagrams have been sent to chemists for printing they have been great failures. I am sure we are very much indebted to Dr. Green for his splendid demonstration.

Dr. STANLEY GREEN: Mr. President and Gentlemen,—There are only a few questions that I need answer. I am glad to say that physicians are beginning to recognise that we can help them a little with the rays, and I hope that in the future we shall persuade them to send their cases to us for early diagnosis or for confirmation of their diagnosis where they have any doubt. I quite agree that the work must be in the hands of experts and preferably those who have made a study of the radiography of the lungs. Personally I have been doing this work for the past five years, and every day find that there is more to learn; until the radiographer has examined a large number of cases he will constantly find it difficult to rightly interpret the plates when they are developed. With regard to what Dr. Lewis Jones has said about making an early diagnosis, I am perfectly satisfied that I am able to make a diagnosis earlier and with more certainty than is possible in the ordinary way. As I have shown you in my slides, there are cases where we can detect signs of disease which are not apparent to the ordinary method of examination until seven or eight weeks later.

Now with regard to the breathing, when I first began to radiograph lung cases, I used to ask the patient to hold the breath as long as possible and make the exposure while the ribs were in the position of maximum inspiration, turning the light out as soon as I saw that expiration was necessary; but as I found that this method often produced a fit of coughing and that it really was not necessary, I gave it up, and now I allow the patient to sit up and breathe quietly.

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As to the exposure necessary, I have not found any difficulty in this. I used to think that unless the correct exposure were given the presence of the diseased tissue would not be found, but this is not so, there is a wide limit; but the plate must not be overexposed or you will lose all the detail. It is better to give a moderate exposure and develop up as far as ever you can, but I have found that sixty seconds is ample for any case, however stout a chest you may have to penetrate. A little experience will soon clear away all these difficulties, and if the developing is carried out by the medical man himself, he will see a good deal during the progress of development that he would miss if he only saw the plate in its finished condition.

Treatment of Alopecia Areata with Currents of High Frequency.—Luigi Vardiani records the treatment of a case of areata of a year's standing, which had been rebellious to all forms of treatment. The disease involved three-fifths of the entire scalp, as well as a large portion of the beard. The patient was forty-eight years of age, in the best of health and in good circumstances. He had had rheumatism and multiple osseous lesions, probably tubercular, as a child, and was of a nervous habit. The disease reached its full severity in fifteen days from its beginning, leaving many circular bare spots in scalp and beard, over which the skin looked normal, with no vesication or desquamation. High frequency current was used at first only on the scalp; duration of the application two to eight minutes, for twenty-four sittings. Hyperæmia of the skin was produced to varying degrees over different locations, where it was greatest being the spots that were most quickly covered by hair. The hairs were at first fine and white, then became thicker and for the most part black, a few being white, corresponding with the hair over the normal scalp. The cure began from the periphery of the patches, extending in toward the centre. The beard was not at all improved until direct applications were made to its bare areas. The recovery of the case was complete.—*Am. Journ. of Progressive Therapeutics*, Oct., 1905. R.H.C.

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THE MEASUREMENT OF THE CURRENT PASSING THROUGH AN X-RAY TUBE.

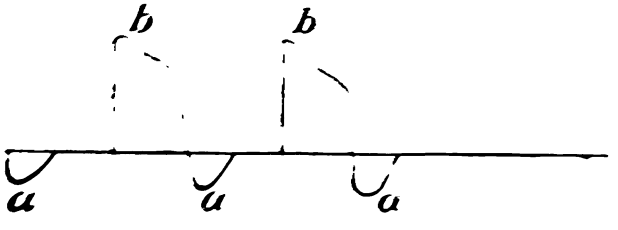
By REGINALD MORTON, M.D., F.R.C.S.E. (London Hospital.)

Considering all that has been said and written on the subject of the measurement of X-ray currents, one might be led to suppose that there was little if anything left to put together in the form of a paper fit to present to this Society.

On the other hand, if we think carefully over the conditions present in the circuit of the X-ray tube, such as the character of the current itself, and the inherent properties of the measuring instruments employed, we are forced to the conclusion that our results are not only liable to error, but are practically certain to be faulty, and, at the best, mere approximations to the truth.

That an accurate knowledge of the amount of current passing through the X-ray tube is to be desired has been very ably shown by Dr. Lewis Jones in the two valuable papers he has given us during the past twelve months; how far such knowledge will prove useful it is not my purpose to touch upon. Speaking in a speculative way, from the evidence available up to the present, it would appear that its practical utility is likely to be limited. If we could keep all the other factors in the circuit constant, an accurate measurement of the current passing through the tube would be all one could desire; but, as is well known, we seldom find two X-ray tubes exactly alike, and any given tube is a more or less constantly varying factor while it is in use at least, and possibly also while it is lying idle. The interrupter is another variable factor, as is also the voltage of the supply: all of these add enormously to the difficulties of obtaining standard results—that is, results that will form a reliable guide to other workers with other X-ray apparatus.

Consequently, in regard to experimental work on instruments and methods for measuring X-ray currents, we are at the great disadvantage of having at least two unknown quantities, where only one should be present in any scientific experiment which is to lead to a definite and a valuable result. Consider for a moment the character of the current flowing in the secondary circuit. Here is a tracing of a current from an induction coil:—



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The part marked *A* is the current at "make," and *B* is the current at "break." This coil had a hammer break of the "Vril" type, and was set to give a long period of contact. This is shown in the space of "no current" between *A* and *B*. Thus we have a short, low tension wave in one direction; a more or less prolonged pause—this latter is variable at will, of course—and finally a high tension wave of a longer duration than the first wave in the opposite direction. This is the wave we are most concerned with. Now in a circuit having such a complexity of conditions present, what is the best that can be expected in the way of measurement from any of the instruments we have available? They can only give us the mean of the total energy flowing through the circuit, or the difference between the means of the two alternate waves with a reduction in the result on account of the period of "no current." Practically, all the instruments used are of the moving coil type, in which the swing of the pointer varies with the direction of the current.

Such an instrument placed in circuit with an X-ray tube gives indications which are practically valueless. For though the current at "break" is ever so much greater, both as regards potential and duration than the current at "make," yet, owing to the fact that the resistance of the tube to reverse currents is less than to those in the proper direction, their effect on the instrument is almost as great as the currents at "break." This was once shown in the case of three coils, used solely for treatment in the London Hospital, which were fitted with these instruments in the secondary circuit at first. Under no circumstances could the milliampèremeters be made to read more than 0·2 or 0·4 m.a., though the current at times was such as to heat the anode of a large Müller tube to a bright red in a few seconds. Finally, a valve tube was put in circuit and, in spite of the resistance thus added, the hand swung over to nearly the end of the scale which was graduated to 5 m.a.

The obvious conclusion to be drawn from this observation was that a valve tube should always be placed in circuit, and there is no doubt that it is a great advantage, apart from the fact that it enables the milliampèremeter to give a more correct reading; it prolongs the life of the tube and reduces the number of extraneous rays, resulting in the production of cleaner radiographs. But it must be remembered that in introducing a valve tube into the circuit we are admitting one more unknown factor into the field of experiments and one that introduces new complications. The vacuum of a valve tube alters in the same way as an X-ray tube, though perhaps not to so great an extent as the latter, and it is found that to get the best results it is necessary to observe a certain ratio of resistance between the valve and X-ray tubes,

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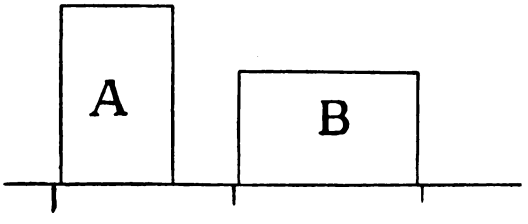
Again, we must remember that a valve tube is a valve in a relative sense only ; it is never as efficient as a water or steam valve can be made ; and until we know its degree of efficiency under any given conditions of marking the reading of the instrument must be more or less misleading, especially with high tubes. Supposing, however, we do not have a perfect valve, how much do we learn in the way of exact knowledge of the current exciting the X-ray tube?

To go back to the tracing above given the valve tube has suppressed the current at "make" marked *A*, so that we have a longer period of "no current" than we had before. The milliampèremeter will integrate, not merely the wave of irregular form, but the wave plus the period of "no current," that is, it will indicate a mean current considerably less than the mean of the wave itself.

Thus it would seem, at first sight, that the use of a valve tube would clear up most of our difficulties, but further consideration shows that its introduction into the circuit is not an unmixed blessing. The most that can be said is that while the milliampèremeter readings in a circuit without some form of valve are practically valueless, the introduction of an efficient valve, properly adjusted to the X-ray tube in use, so alters the reading as to bring it considerably nearer to the truth ; and in fact gives one some sort of practical guide which has a definite value, but which is still far from perfect.

What I mean by "far from perfect" can be best shown diagrammatically.



A and *B* are supposed to represent two current waves, they are of equal area but differently disposed. While a galvanometer would give equal readings in either case I am perfectly certain the effects would not be the same. I would expect a much more intense X-ray output from a tube excited with the higher tension wave *A*, though it be of shorter duration than in the case of waves like that shown at *B* of lower tension but of correspondingly longer duration.

Thus it comes that ordinary measuring instruments fall very far short of ideal requirements, and that if we want more exact results we must pass on to some other type of instrument. From the fact that we must know something of the

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form and duration of the current waves as well as the duration of the internal of "no current"—and all these factors will be found to differ individually and collectively in different coils, and also in the same coil with each variation of the adjustments in the primary circuit—the only instrument that can help us would appear to be some form of oscillograph in which the waves could be observed directly and easily, and one provided with a scale indicating the intensity of the current at any moment or part of the wave.

The name of Oscillograph is probably enough to give some of you the "cold shivers," and to give you cause to think you have spent a most unprofitable evening, if at the end you are to be told that the new method involves the use of a Duddell's oscillograph, which costs not much under £150, if not more, and requires one or two skilled assistants to work it.

You will find, however, that such is far from being the case. The new instrument, which it is my privilege to bring before you this evening, is very moderate in price, and its operation is simplicity itself.

In its simplest form it consists of a plain glass tube, rather over a foot long, having a uniform diameter of 2 inches and closed at both ends, in the exact middle of which the electrodes are fixed.

These electrodes consist of two metal wires, perfectly straight and of uniform diameter. They are of equal length, so as to nearly meet in the centre of the tube, and are disposed along the axis of the latter.

The distance between the electrodes is about $\frac{3}{32}$ of an inch, and they are quite unsupported, except for the first inch or so of their length. The ends of the electrodes are nicely rounded and polished. These details regarding the electrodes are very important, any roughness, sharp corners, or want of uniformity in diameter have a serious effect on the proper working of the instrument.

Exactly in the centre of the tube and between the ends of the electrodes is placed a diaphragm of mica, porcelain, or other fireproof insulating material, of such a size as to loosely fit the interior, and maintained in position by indentations made in the wall of the tube from the outside. In the centre of this diaphragm is a small hole about $\frac{1}{25}$ of an inch in diameter.

The tube is exhausted to a pressure of from 3 to 4 mm. of mercury, which is a much lower vacuum than any X-ray tube. As there are no cathode rays at this degree of exhaustion the vacuum of the tube does not alter with use.

The resistance of the tube is rather less than an air gap of $\frac{1}{8}$ inch, so that with the coils we use its influence on the conditions in the circuit may be neglected.

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We now come to the principle upon which this instrument works. It is based on the fact that the negative glow in a Geissler tube is proportional to the current passing, so long as the cathode is not completely covered by the glow. This was observed by Wilson, though which particular *Wilson* I have not been able to ascertain.

When this tube is placed in circuit the electrodes, when negative, become covered with a purple glow.

If the current is continuous, or at least unidirectional, the glow will be present on one side of the septum only. If the current is derived from the alternating main it is seen to extend for an equal distance on each side of the septum. If the current is unsymmetrical the glow on the two sides will be unequal.

This instrument requires a potential of 300 volts or thereabouts before it begins to work.

The anode does not show a column of light like the negative except when large currents are passing—about 0·1 amp. Under ordinary conditions the anode "glow" is represented by a reddish light spot at the point of the electrode, and it is undesirable that it should be in evidence more than this.

The degree of vacuum has to be very carefully adjusted. If this is too high the tube becomes more sensitive; but the brightness of the glow is diminished and less useful photographically.

When using this tube it is noticed that the length of the column of light covering one or both electrodes, according to the character of the current passing through it, gradually increases for a minute or two. The tube is not perceptibly warmed for some time after this, but in all probability this is a heat effect—it is not very easy to see what else it can be.

Mention is made of this as a possible source of inaccuracy in its performance. When a new instrument comes to our notice, especially if it possesses novel properties, as this undoubtedly does, the natural tendency is, for most of us, to give it credit for all the virtues, at first. Its defects become apparent as we use it and get to know its idiosyncracies, and so I think it as well to point out this peculiarity in view of the possibility of its affording some clue in discovering the cause of any complications that may arise.

This instrument is too new and too little investigated as yet for anyone to get an accurate idea of its real value, and one of the objects of my bringing it to your notice is that some of you may be tempted to attack the subject seriously and give us a report of your observations at some future date.

Now this glow possesses neither momentum nor inertia, and consequently its movements are absolutely aperiodic. If

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the tube has been calibrated the extent of the glow will indicate the maximum current only.

With an ordinary moving coil and a vacuum milliampèremeter both in circuit, the former would give the mean current passing, while the latter would give the maximum current. The latter might be double the former and yet both be correct, and having these two readings we would be in a position to better appreciate the actual current passing through the tube. For instance, if the two readings were very wide apart we would know that the form of the wave was a high one and of short duration; if they were near together, then it would be of lesser height but of longer duration. So I claim that even if the instrument is used only in this simple way it gives information which has a decided value. Yet however clever one might become in diagnosing the shape of the current curve in this manner, it would be infinitely more satisfactory if we could SEE the curve in its correct form, provided this could be done in any simple and uncomplicated manner—and this is what can be done, as I shall show you.

Considering that the movements of the glow are absolutely aperiodic, it is evident that this glow, apparently stationary, must move up and down the electrode exactly in time with the fluctuations of the current, and if we examine it with a moving or, preferably, rotating mirror, the instantaneous amplitudes are separated out and we have a correct rendering of the curve.

Probably no instrument enables one to appreciate the beauties of the rotating mirror more than this.

Instead of giving a mere outline as in other forms of oscillograph, the whole space enclosed by the curve shows as a hand or block of purple light. When the tube is in action a spot of bright light (anode) travels between the electrodes by way of the small hole in the diaphragm. This comes out as a bright streak along the middle of the image in the mirror indicating the position of the zero line.

The relative size and shape of the different waves, as well as the duration of the interval, are shown most clearly and with the greatest precision, and as the glow light is very actinic it is easy to obtain photographic records of the curves, if we have suitable motors to drive the rotating mirrors.

If we want a record of the alternating current from a dynamo, we drive the mirrors with a synchronous motor actuated from the same source, when the image of the double sine curve appears perfectly stationary.

Any form of current continuous, alternating, pulsating, or combination of these are shown quite easily, as also the discharge from a condenser.

For the class of work with which we are immediately concerned, it shows the flow of current in high potential

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apparatus, the influence of various forms of interrupters, efficiency of valve tubes, and by means of a step-up transformer we can study the curves of faradic and sinusoidal currents used in electrotherapeutics.

It is not to be supposed the instrument has reached finality in its development, but I think I may fairly claim for it that it is a great help to us in the study of X-ray currents at least, and I am very glad of having had this opportunity of bringing it to your notice so soon after it has been placed on the market. I may say the available literature bearing on this instrument is very scanty, one single article by Gehrcke in a German journal being all I could find.

The milliampèremeter tube differs from the ordinary pattern in having the diaphragm nearer to one end, so as to give a longer scale. The calibration is done separately for each tube, by means of a high potential primary battery which ensures accuracy in the readings.

Experiments:

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Influence of hammer break	—
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Effect of a poor valve or one badly adjusted to the conditions	—

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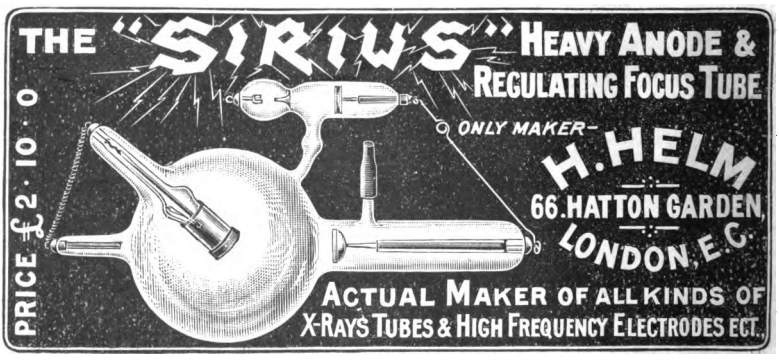
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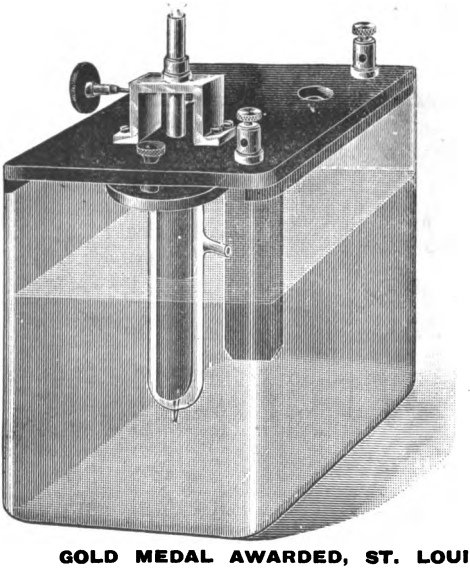

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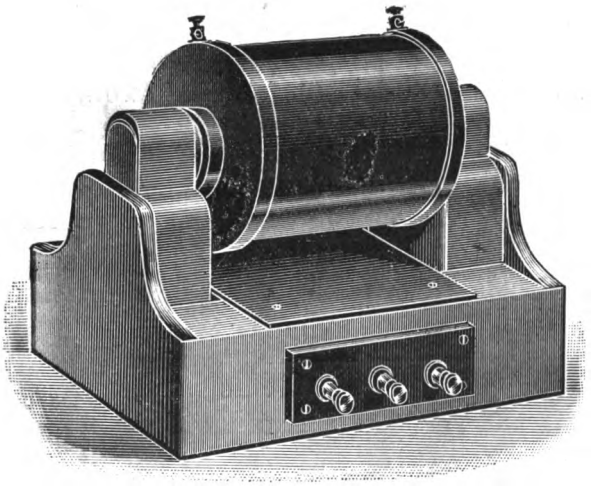

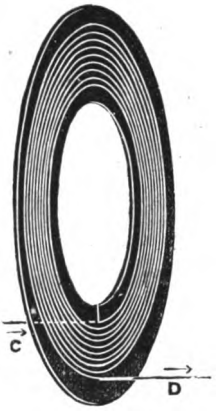

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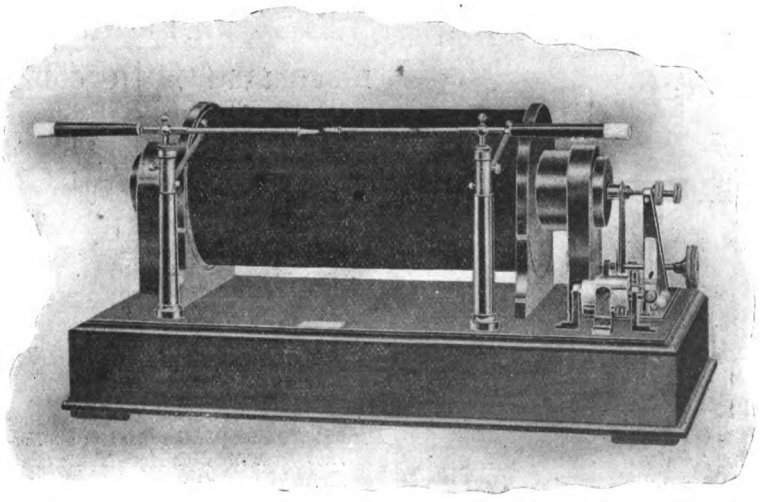

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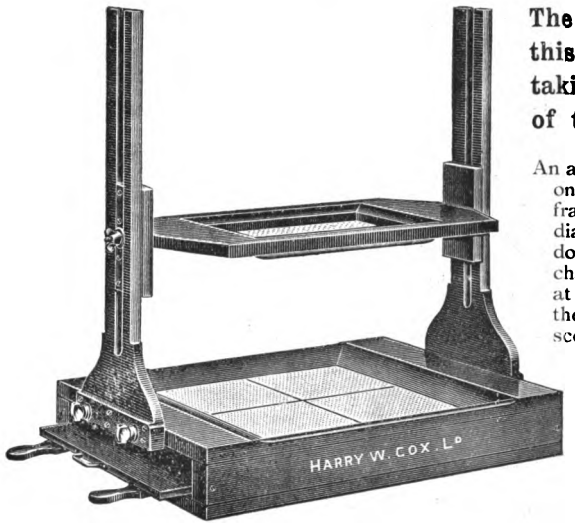

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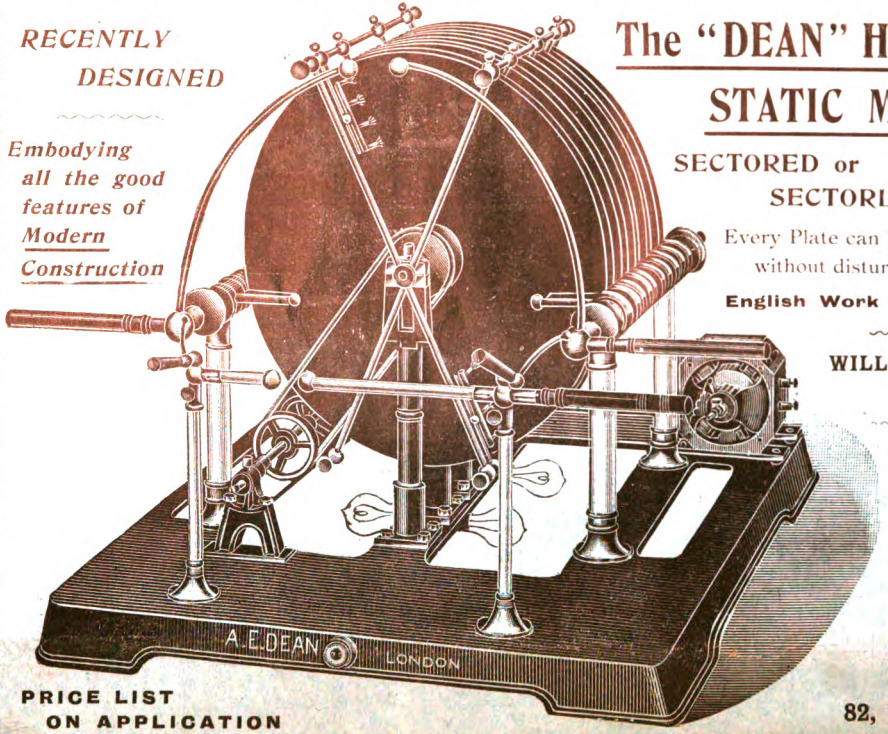

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